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CONTENTS

I. THE LITERATURE ON RAILWAY RATE THEORY	
	<i>D. Philip Locklin</i> 167
II. THEORETICAL REMARKS ON PRICE POLICY. HOTEL- LING'S CASE WITH VARIATIONS -----	<i>F. Zeuthen</i> 231
III. THE LOCATION OF THE SHOE INDUSTRY IN THE UNITED STATES -----	<i>E. M. Hoover, Jr.</i> 254
IV. THE PROCESS OF INDUSTRIAL CONCENTRATION	
	<i>Arthur Robert Burns</i> 277
V. UNEMPLOYMENT RESERVES: SOME QUESTIONS OF PRINCIPLE -----	<i>R. S. Meriam</i> 312
LITERATURE, NOTES AND DISCUSSIONS:	
The Theory of Railway Rates Once More ----	<i>F. W. Taussig</i> 337
The Elasticity of Demand from Family Budgets --	<i>A. C. Pigou</i> 342
The Wooden Money of Tenino -----	<i>Howard H. Preston</i> 343
Member Bank Reserves and Bank Debits -----	<i>L. B. Currie</i> 349
Speculation and the Stability of Stock Prices ----	<i>M. J. Fields</i> 357
Life Tables for Automobiles -----	<i>George Gardner</i> 368
Books Received -----	370

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CONTENTS FOR AUGUST, 1932

- | | |
|---|---------------------------|
| I. THE THEORY OF INTERNATIONAL VALUES | Frank D. Graham |
| II. SUGGESTIONS FROM WORKERS: SCHEMES AND PROBLEMS | Z. Clark Dickinson |
| III. THE NORTH ATLANTIC PORT DIFFERENTIALS | R. W. Harbeson |
| IV. STUDIES IN DEMAND: MILK AND BUTTER | Elizabeth Waterman Gilboy |
| V. UNEMPLOYMENT AND CONSUMPTION:
THE MERCANTILIST VIEW | E. A. J. Johnson |
| LITERATURE, NOTES AND DISCUSSIONS: | |
| Industrial Relations in Southern Textile Mills | Charles A. Gulick, Jr. |
| Books Received | |

CONTENTS FOR NOVEMBER, 1932

- | | |
|--|-----------------|
| I. THE STATISTICAL MEASUREMENT OF THE "VELOCITY OF CIRCULATION OF GOODS" | A. W. Marget |
| II. THE STATIC AND THE DYNAMIC IN STATISTICAL DEMAND CURVES | Wirth F. Ferger |
| III. THE BRITISH WHEAT ACT, 1932 | Alfred Plummer |
| IV. ERNST ENGEL'S LAW OF EXPENDITURES FOR FOOD | C. C. Zimmerman |
| V. ECONOMIC PLANNING:
THE PROPOSALS AND THE LITERATURE | P. T. Homan |
| LITERATURE, NOTES AND DISCUSSIONS: | |
| A Note on the Development of the Doctrine of "Forced Saving" | F. A. von Hayek |
| "Elasticity of Demand" from Budget Studies | Albert E. Waugh |
| An Equation for the Price-Level of New Investment Goods | B. R. Shenoy |
| London Life and Labor | Niles Carpenter |
| Books Received | |

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THE QUARTERLY JOURNAL OF ECONOMICS

FEBRUARY, 1933

THE LITERATURE ON RAILWAY RATE THEORY

SUMMARY

I. Railway rate theory developed to explain and justify rates not based on cost, 168.— Early analysis an overhead-cost theory, 173.— Terminology, 174.— Development of overhead-cost theory, 178.— Joint-cost explanation, 182.— Criticism of the analogy, 184.— Monopoly explanation, 185.— Grouping of later writers, 186.— The attack on the joint-cost theory, 189.— Back hauls, 197.— Defenders of the joint-cost theory, 199.— Classification of recent writers, 203.— Discrimination not always possible, 206.

II. Do preferential rates burden other traffic? 208.— Charging what the traffic will bear and monopoly profits, 214.— Value of service leading to excessive rates, 220.— Arguments for cost of service, 224.— Are cost allocations practicable? 225.— The assumption of unused capacity, 228.— Differential charging will persist, 229.

Railroad transportation is approximately one hundred years old. The literature relating to the theory of railway rates, however, falls short of spanning a complete century. A few scanty passages in the '30's presaged more complete explanations which were to follow. The '40's saw a substantial development of the theory, particularly in France, but this fact does not seem to be generally recognized. It was not until the '70's and '80's that economists turned their attention to railway charges.

The present article undertakes to review the body of literature which has developed on the theory of railroad rates. Special attention is paid to English and American writers, but mention must be made of a number of continental writers who were influential in the development of the theory and to whom various writers have acknowledged indebtedness.

The literature of railway rate theory is concerned with two very different things: first, an explanation, and second, a justification (or criticism) of the methods of adjusting rates. In other words, the literature describes not only how rates are made, but how, in the estimation of the writers, they ought to be made. This suggests a convenient method of dividing this review. Part I will be concerned with the explanation of railroad rates; Part II with the justification or criticism.

I. DISCRIMINATING RATES EXPLAINED

The theory which was originally developed to explain the peculiarities of railway rates was soon found to have a much wider application. This fact, together with the importance to economic theory of certain controversial questions debated in the literature of the subject, makes the topic of interest not only to specialists in railway economics but to economists in general.

The thing which the theory of railway rates had to explain was the lack of uniformity in charges for services performed at approximately equal costs. Stated in another way, the theory had to explain the practice of "differential charging" or "discrimination." The term "discrimination" is not used here in an invidious sense. In popular usage the word "discrimination" carries with it the implications of the longer phrase "unjust discrimination" or "unreasonable discrimination." The word will be used here in the sense of differences in rates not based on differences in cost of service. In railroad parlance the practice of differential charging was summed up in the phrases "charging what the traffic will bear," or basing rates on "the value of the service." Both phrases, if used in a broad sense, refer to the adjustment of rates according to the conditions of demand, and not according to cost of service. This practice required an explanation, and the theory of rates was developed to explain it. Certain recent writers have suggested that it is not the economist's duty to explain why and how price differentiation emerges. G. P. Watkins says that price differentiation is the usual thing and uni-

formity of price the unusual thing,¹ and J. M. Clark contends that discrimination is so nearly universal that "it needs no elaborate explanation; rather, when it is absent, its absence needs explaining."² But, historically, the theory of rates was an attempt to explain an apparent anomaly. And there seems to be no reason why economists should not be equally interested in the forces making for equality of prices and the forces making for inequalities or discriminations.

The practice of adjusting rates to the conditions of demand manifested itself in a number of ways. It resulted in the practice of classifying freight, and of granting exceptional or special rates on commodities that required particularly low rates. The practice of discriminating between commodities was sometimes carried so far as to result in different rates upon the same commodity, dependent upon which of several uses was to be made of the article. Differential charging also resulted in rates that bore no relation to distance. Unequal rates for equal distances, equal rates for unequal distances, such as result from "group" or "blanket" rates, the practice of reducing the rate per mile as distance increases more than can be justified by the lower per-mile cost, the extreme case of charging a larger aggregate sum for shorter than for longer distances over the same line and in the same direction were all phenomena which grew up as a result of charging according to the conditions of demand. Rebating and other forms of personal discrimination resulted from the same policy. Many apparent discriminations between commodities and between places could be justified by differences in cost of service, but these are not discriminations in the proper sense of the word. A satisfactory theory of rates must explain discrimination in all its forms: discrimination between commodities, persons, and places.

The system of differential charging is as old as the railroads. In fact it is older than the railroads, for canal tolls, bridge tolls, and turnpike tolls were based upon the same

1. "The Theory of Differential Rates," 30 *Quarterly Journal of Economics* 682, 683-684 (1916).

2. *The Economics of Overhead Costs* (1923), p. 433.

principle before the days of railroads. The first freight classifications were frequently based on canal classifications. Usually not more than two or three classes were found, but the number steadily grew as the classifications became more and more complicated. To what extent the classifications represented a conscious attempt to vary the charges according to what the traffic would bear it is impossible to say. But there were apparently some adjustments that were to be explained upon an ability-to-pay basis rather than upon a cost basis. Nicholas Wood, in the third edition of his *Practical Treatise on Rail-roads and Interior Communication in General* (1838), gives the charges levied on the Newcastle-upon-Tyne & Carlisle Railway.³ Coal for domestic consumption was charged a toll of $1\frac{1}{2}$ d. per ton-mile, but coal for exportation was charged only 1d. per ton mile. Here was apparently an example of "favoring the foreigner" concerning which there was much acrimonious debate in England at a later date.

A few writers in the late thirties and early forties became aware that an increase in the volume of railway traffic would not proportionately increase expenses, and that such increases in traffic could be induced by low charges. Thus P. P. F. Degrand in *An Address on the Advantages of Low Fares and Low Rates of Freight* (1840) said: "It is . . . vain to say that *because* the Worcester Railroad carried in 1839, only 30 Tons of Freight per Train, on an average, *therefore* they cannot reduce their Rate of Freight. The low Price creates large additional Masses of Freight: and 100 Tons, in one Train, at \$1.25 per Ton, will produce \$125, whereas, 30 Tons, at \$2.40 per Ton, only produce \$72 and the Train of 100 Tons (distinct from the Expense of Loading and Unloading) would occasion no additional Expense worth mentioning, beyond the Expenses of the Train of 30 Tons."⁴ Degrand cites a great many examples of the increase of railway profits occasioned by reductions in rates which stimulated trade or travel. Most of his illustrations are drawn from testimony before Parlia-

3. P. 738.

4. Pp. 36-37.

mentary committees. William Galt in *Railway Reform* (1843) refers to the possibility of reducing fares and increasing passenger travel. He shows that the number of persons carried could be increased many times without appreciably increasing expenses. He refers to the "waste of power" resulting from the small number of passengers carried.⁵ James Morrison in *The Influence of English Railway Legislation on Trade and Industry* (1848) recognizes the possibilities of increasing profits by reducing rates and fares, and he also sees that there are limits to the principle. He quotes a witness before a Parliamentary committee to the effect that "you increase your income, by diminishing your fares up to a certain point; and beyond that point, if you go on diminishing the fares, you diminish your income."⁶ These writers were more interested in the possibilities of general reductions in rates and fares than in the process of increasing income by further classification of passengers and freight, but they seem to have caught the principle which has come to be known as the principle of "increasing returns."

An early reference which indicates that railroad officials were not ignorant of the possibilities of increasing profits by special concessions where necessary occurs in the Report of the Engineers of the Philadelphia & Reading Railroad Company (1839). Referring to improvements which had been made to reduce operating expenses, the engineers said: "The Company have thereby insured themselves larger profits on articles which can bear the customary rates of railroad transportation, and more or less profit on every article, . . . which can be transported at all in any other way."⁷ It seems clear, however, that railway managers were slow to realize the possibilities of increasing profits by differential rates. Acworth repeats the exclamation of a director of the London & Birmingham Railway when it was suggested that the railroad ought to carry coal: "Coal! Why they will be asking us to carry

5. P. 10, *passim*.

6. P. 36.

7. P. 4.

dung next."⁸ And as late as 1848 it appears that the directors of the Pennsylvania Railroad were divided on the question of whether it would be possible to quote a low rate on coal so that it might be shipped by rail.⁹

As soon as the practice of discriminatory rates became common and the public sensed that rates were adjusted according to the exigencies of demand and not in conformity with costs, the railroads became the objects of attack for their arbitrary methods of rate making. Equal mileage rates were advocated, and "pro rata" railroad bills were introduced in many legislative bodies. The attack upon the railroads was due in part to the injustices occasioned by uncontrolled discriminating practices, and partly to the failure of the public to see that some differential charging was not only harmless but beneficial. A flood of pamphlet literature on both sides of the controversy appeared. Legislative committees, in the United States and abroad, investigated the methods of railroad rate making. The theory of railway rates originated very largely as an explanation and justification of the principle of charging what the traffic would bear. The spokesmen of the railways carried their defense of the system too far and denied the necessity of any public control over railroad rates.

Economists had very little to do with the theory of rates at this stage of its development. Many of the earlier writers considered that railway rates could not be explained in terms of economic theory. As late as 1905, W. C. Noyes referring to the peculiarities of the railroad said: "Its rates are determined by economic principles peculiar to itself."¹ This view was undoubtedly held because of the inadequateness of the classical theory to explain the peculiarities of railway rates. The classical theory had developed an explanation of value for simpler conditions of production under which nearly all

8. *The Railways and the Traders* (1891), p. 64; *Elements of Railway Economics* (1904), p. 63.

9. J. L. Ringwalt, *Development of Transportation Systems in the United States* (1888), p. 130.

1. *American Railroad Rates*, p. 1.

costs were variable costs. Railroads, with their large mass of overhead costs, represented a new phenomenon, or if not a new one, one which had received very little attention from economists. The classical economists did not solve the problem of value in this special case, says J. M. Clark, "because their world contained nothing quite like it."² Their world, however, did contain something quite like it, namely, canal, turnpike, and bridge tolls. And here fixed or overhead expenses were of even more importance than on railroads, but the phenomenon seems never to have received more than passing attention from economists.

When the economists began to write on the subject, they sought to reconcile the explanation of railway rates with the general theory of value. Thus Taussig's famous article "A Contribution to the Theory of Railway Rates"³ was a protest against the tendency to give an ethical and non-economic explanation of railroad rates. But in reconciling railway rates and economic theory, the theory itself underwent a modification to cover the general case that has become so characteristic of the present age — the production of goods under conditions which require large aggregations of fixed and specialized capital.

The theory which was developed to explain railway rates may be denominated an "overhead cost" theory, altho the term "overhead costs" only appears in comparatively recent literature. The early explanations began with a showing that railroad expenses were of two sorts: variable expenses, which increase more or less in proportion to the volume of traffic; and constant expenses, which are independent of the volume of traffic. Another way of approaching the problem was to show that railroads were subject to "the law of increasing returns."⁴ But these demonstrations are too familiar to require a description here.

2. Standards of Reasonableness in Local Freight Discriminations (1910), p. 22.

3. 5 Q. J. E. 438 (1891).

4. The term "increasing returns" is in some respects unfortunate. It would seem to be the opposite of "decreasing returns," but the law of decreasing returns refers to changes in physical output when one factor

TERMINOLOGY

The distinction between variable and constant expenses was fundamental in the earliest as well as the later explanations of railroad rates. The terminology, however, is not uniform, and a great many terms are used to designate these two classes of expenses. The terms "direct" and "indirect" expenses, or "prime" and "supplementary" costs are very frequently used. Sometimes the terms "dependent" and "independent" costs are used. The terms "special" and "general" expenses, "differential" and "residual" costs, "separable costs" and "joint costs" are also used, but these refer to a somewhat different scheme of classification. An early writer on electrical rates refers to variable costs as "running costs," and to constant costs as "standing-by costs."⁵ The phrase "out-of-pocket costs" often appears, and it has been called "the practical man's term for prime cost."⁶ Prime costs are sometimes called "elastic" costs. Constant costs are frequently referred to as "fixed expenses," a term which should not be confused with "fixed charges." The latter term refers to interest payments, rentals, and taxes, which comprise some but not all the expenses which may be called fixed expenses. Constant costs are commonly called "overhead costs," or "burden." The latter term is common among accountants. A somewhat unusual name to denote constant expenses is "dead costs."⁷ All of these attempts to classify railroad expenses have one thing in common. They seek to distinguish between the expenses which fix the minimum rate that can, or should, be charged on particular items of traffic, and the expenses which may be distributed according to the demand for the service.

of production is varied and the others remain constant. Increasing returns or decreasing costs refers to the decline in unit costs when output is increased, due either to a more complete utilization of plant, or to the greater economy of a large than a small establishment.

5. Arthur Wright, "Cost of Electrical Supply," Minutes of the Municipal Electrical Association, 1896, pp. 1-8.

6. G. P. Watkins, *Electrical Rates* (1921), p. 118.

7. A. W. Kirkaldy & A. D. Evans, *The History and Economics of Transport* (1915).

Sometimes the constant costs are subdivided into two classes. First there are the costs which represent a return upon the capital invested. These expenses cannot be saved by going out of business, when the investment represents fixed and specialized capital. Other constant expenses represent actual cash outlays which can be saved by discontinuing business. H. G. Brown calls the first class of costs "sunk costs" and distinguishes them from the general expenses of the business.⁸ Irving Fisher makes a similar distinction.⁹ The distinction is important when discussing the limits to rate cutting in the face of competition. In demonstrating that railroads are subject to ruinous competition, it is frequently pointed out that under the stress of competition rates will be reduced to prime costs. But a railroad must derive sufficient revenue from its traffic to pay its operating expenses including the general expenses of the business, tho it need not, for considerable periods of time, derive any return on the capital invested. The railroad will not go out of business if it fails to earn a return upon capital invested — not as long as the plant lasts; but a railroad would soon go out of business if it could not earn actual operating expenses. Sunk costs, therefore, affect rates less than the other constant expenses of a business.

The more careful analyses of railroad expenses have, for the most part, referred to the variable expenses and the constant expenses as a certain per cent of the total expenses. It is commonly asserted, for instance, that the variable expenses represent one-third of the total expenses of a railroad, and the constant expenses two-thirds. Different writers have suggested different proportions. J. M. Clark has pointed out that it is mathematically impossible for one-third of the expenses to vary with the traffic and still remain one-third, if the rest remain constant.¹ This can be easily demonstrated. If, in a particular case, one-fourth of the expenses were

8. *Transportation Rates and their Regulation* (1916), pp. 11-12, 18-24.

9. *Elementary Principles of Economics* (1912), pp. 323-328.

1. *Economics of Overhead Costs* (1923), p. 259.

variable and three-fourths constant, and the volume of traffic doubled, the variable expenses would become two-fifths, and the constant expenses only three-fifths, of the total. The attempt to express the constant and variable expenses as a definite proportion of the whole is somewhat unfortunate. The important thing to note is that the variable expense is small per unit of traffic, and that there is a mass of constant expenses which, if assigned to different items of traffic in different amounts, causes substantial differences in rates.

Throughout all of the explanations of railroad rates runs the assumption of unused capacity which makes preferential treatment of some traffic advantageous in order to utilize capacity to best advantage. A rather novel method of referring to the fact that low-grade traffic need contribute little to the return on capital in order to be profitable is found in recent writings of E. F. Heckscher. He says "a very great part of a railway is an 'intermittently free good' to be looked upon, for a shorter or longer time, in the light of a free gift of nature."²

Some controversy has been provoked by the assertion that the classification of expenses into "special" and "general" is not the same as the classification into "variable" and "constant." The point of view, it must be admitted, is different in the two cases. When a distinction is made between constant and variable expenses, one is thinking of variations in the traffic as a whole over a period of time, and their effect upon expenses. When the distinction between special and general expenses is in mind, one is thinking of the possibility of tracing expenses directly to specific units of traffic. M. O. Lorenz, who calls attention to the difference in the two systems of classification,³ points out that when particular ship-

2. League of Nations, Report of the Special Committee on Competition between Railways and Waterways (1929), p. 34. The idea is more fully developed in "Intermittent freie Güter," 59 *Archiv für Sozialwissenschaft und Sozialpolitik* 1 (1928).

3. "Constant and Variable Railroad Expenditures and the Distance Tariff," 21 *Q. J. E.* 283 (1907). See also "Cost and Value of Service in Railroad Rate-Making," 30 *Q. J. E.* 205, 219 note (1916). The same distinctions are made by Douglass Knoop, *Outlines of Railway Eco-*

ments are considered, practically no expenses are special, but when larger units of traffic, say coal, are considered, more expenses can be traced. But expenses which can be shown to vary with the volume of traffic may, as Lorenz himself points out, properly be attributed to specific shipments by averages. This is proper, because a causal relationship between traffic and expenses may be presumed when variability of expenses with traffic is established. If we may properly assign such expenses to particular units of traffic, those expenses may be termed special without doing violence to the term, and the supposed distinction between special costs and variable costs largely disappears.

Of course even constant expenses are special to large classes of traffic. Interest on the investment in freight depots is special to freight traffic and not to passenger traffic, tho it is not special to particular kinds and units of freight traffic. But when developing a theory of rates we are interested in particular kinds of freight traffic. And when this is done variable costs may properly be identified with special costs.

But it also alleged that the distinction between constant and variable expenses entirely disappears if a long period of time is under consideration, while the distinction between special and general costs is permanent. Even capital costs, it is pointed out, vary with the traffic over long periods of time because the more traffic there is, the greater must be the investment. It must be remembered, however, that the theory assumes a certain physical plant. Expenses which vary because the size of the plant varies, are not variable expenses in the proper sense of the word. Hence capital costs are not variable costs. The question of proper rate adjustments at a time when the physical plant must be expanded

nomics (1913), pp. 164-165, and by Vanderblue & Burgess in *Railroads: Rates, Service, Management* (1923), p. 88. J. M. Clark thinks the distinction unduly fine, *Standards of Reasonableness in Local Freight Discriminations* (1910), pp. 31-34. Haney agrees with Lorenz, in "Joint Costs with Especial Regard to Railways," 30 *Q. J. E.* 233, 242-245 (1916), but G. P. Watkins criticizes Lorenz for distinguishing between the two classifications, in "The Theory of Differential Rates," 30 *Q. J. E.* 682, 697 note (1916).

will be discussed later. For the purpose of developing the theory of differential charges on railroads, we must assume a certain physical plant. When this assumption is made, the important distinction to make in the nature of railroad expenses is that between expenses which vary with the use of the plant, and those that vary with time.⁴

DEVELOPMENT OF THE OVERHEAD-COST THEORY

It has already been pointed out that Degrand, Galt, and Morrison were aware of the fact that railroad expenses did not increase as traffic increased, but they do not seem to have advocated further classification of freight and passengers to utilize the railroad facilities to capacity. One of the first writers who advocated the adjustment of rates according to the conditions of demand was Charles Ellet, Jr., whose pamphlet *Laws of Trade* appeared in 1840. Ellet advocated charges "proportional to the ability of the article to sustain them." He believed that in order to secure the greatest possible revenue, the charges for toll should not exceed half the charge which would exclude the traffic from the line.⁵

In 1844 the cost of transportation on the Belgian railways was analyzed by Jullien.⁶ He recognized that capital costs were fixed costs, but he did not develop the implications of that fact. He considered that all other expenses, including those of management and supervision, increased closely enough with traffic to justify their apportionment on a ton-kilometer basis, and he finally assigned capital costs on the same basis, but suggested that it might be desirable, in making rates, "to relieve merchandise a little, and make travelers carry a larger part of the interest on capital invested."⁷

Perhaps the most complete development of the theory of differential pricing in the earlier literature of the subject was by Dupuit, chief engineer of bridges and roads in France.

4. G. P. Watkins, *op. cit.*, p. 697 note.

5. The writer has not had access to a copy of Mr. Ellet's pamphlet and relies upon a description of it in Ringwalt, *op. cit.*, pp. 112-113.

6. "Du Prix des Transports sur les Chemins de Fer," 8 *Annales des Ponts et Chaussées*, 2d series, 1.

7. *Ibid.*, p. 37.

F. Y. Edgeworth has honored Dupuit by calling him "the earliest, and . . . the highest authority on the theory of discrimination."⁸ Dupuit developed his theory in two articles in the *Annales des Ponts et Chaussées*. The first article, "De la Mesure de l'Utilité des Travaux Publics," appeared in 1844.⁹ He draws illustrations of differential pricing from the commercial world and says that differences in the utility of the same articles to different individuals are the basis of the prices of "all objects of which the expenses of production are composed of two parts; one very costly and made once for all or for a long time, the other less costly made for each object."¹ The second article by Dupuit, "De l'Influence des Péages sur l'Utilité des Voies de Communication," was published in 1849.² The literature of railway theory does not afford any clearer demonstrations of the principle of differential charging than are contained in Dupuit's article. He uses a toll bridge for the purpose of illustration, which is particularly apt because the expenses are so largely constant and bear very little relation to the number of passers.³ He applies the principle of differential charging to canal tolls and to that part of the charges of a railway which represent a toll for the use of the road. Dupuit sums up his theory thus: "It is necessary to demand as the price of the service rendered, not that which it costs to him who renders it, but a sum in relation to the importance that he, for whom it is rendered, attaches to it."⁴

Between the appearance of Dupuit's first and second

8. "Applications of Probabilities to Economics," 20 *Economic Journal* 441 (1910).

9. 8 *Annales des Ponts et Chaussées*, 2d series, 332.

1. *Ibid.*, p. 342.

2. 17 *Annales des Ponts et Chaussées*, 2d series, 170.

3. *Ibid.*, p. 219.

4. *Ibid.*, p. 248. It is pertinent to call attention to another of Dupuit's remarkable anticipations of later views. In 1844 he commented thus on the subterfuge commonly practiced by manufacturers to prevent differentially low prices on some units of product from spoiling the market for the higher-priced units. "The same merchandise, disguised in different stores under a variety of forms is sold very often at very different prices to rich people, to the well-to-do, and to the poor. There are the fine, the very fine, the especially fine, the extra fine, which, although coming from the same cask, and presenting no real differences

articles, Alphonse Belpaire published a book, *Traité des Dépenses d'Exploitation aux Chemins de Fer* (1847). He divides railroad expenses into two classes — general and special — and his analysis leads him to the conclusion that the railroad “has a vital interest in encouraging by a differential tariff full loads and transport at a great distance.”⁵ Belpaire contends that the existence of the general expenses makes impossible the ascertainment of unit costs. This is because the cost depends upon the degree of utilization of the road. “When one distributes this fixed expense over a quantity of work which is essentially variable, it is clear that the result must be indeterminate: it will be the quotient of a division in which the dividend is constant, while the divisor can be big or little, can take any value.”⁶

The next work of importance on the theory of railway rates was by an English writer, Dionysius Lardner. His book, *Railway Economy*, was published in 1850. Lardner recognizes the importance of constant expenses, not only on railroads, but elsewhere in the industrial world. He generalizes on their significance as follows: “The cost of production of the objects of industry, at present, may always be regarded as consisting of two parts, one of which is quite independent of the number of articles produced, and being, therefore, equally divided among them, will render one element of their price precisely in the inverse ratio of the number; but still there will be another component, which, depending on the direct application of manual or other labor, and on the immediate consumption of raw material, will be in the direct ratio of the number of articles produced.”⁷ Lardner does not make use of the distinction between constant and variable costs to explain freight classification, but he apparently takes classification for granted. He is principally interested in showing that it is profitable for a railroad to stimulate long-distance traffic by comparatively low rates. He shows that rates proportional to other than that of the superlatives on the label, are sold at very different prices.” 8 *Annales*, 2d series, 332, 341–342.

5. *Traité des Dépenses d'Exploitation aux Chemins de Fer*, p. 15.

6. *Ibid.*, p. 49.

7. *Railway Economy*, p. 192.

distance will soon exceed the value of the service for long distances, thereby shutting off the movement of traffic.

Recognition of the significance of overhead expenses on railroads is found in a considerable number of publications on railway rates in the sixties, seventies, and early eighties. Among these the following deserve special mention: William Galt, *Railway Reform, Its Importance and Practicability* (1864), an enlarged edition of which appeared the following year; Albert Fink, *Cost of Railroad Transportation* (1875), originally appearing in the annual report of the Louisville & Nashville Railroad for 1874; Emil Sax, *Die Verkehrsmittel in Staats-und Volkswirtschaft* (1879); M. M. Kirkman, *Railway Expenditures* (1880); De La Gournerie, *Études Économiques sur l'Exploitation des Chemins de Fer* (1880); Gerrit L. Lansing, "The Railway and the State," 138 *North American Review* 461 (1884).

President Hadley was the first American economist to concern himself with the theory of rates. His exposition of the subject appeared in his classic volume, *Railroad Transportation, Its History and its Laws*, published in 1885. In an appendix, the theory is presented in mathematical form. No one reading Hadley's explanation of the theory of rates would ever make the error of considering the practice of charging what the traffic will bear as extorting the highest possible charge, nor take the position that low rates on low-grade traffic impose additional burdens on other traffic.

Other discussions of railway rates, following what had now become the orthodox explanation, are found in: E. P. Vining, *The Necessity for a Classification of Freight and the Principles on which it is Based* (1884); J. Grierson, *Railway Rates* (1886); A. M. Wellington, *Economic Theory of the Location of Railways* (1887); E. P. Alexander, *Railway Practice* (1887); Gerrit Lansing, *Natural Principles Regulating Railway Rates* (1887); the especially clear exposition in E. R. A. Seligman, "Railway Tariffs and the Interstate Commerce Law";⁸ W. D. Dabney, *The Public Regulation of Railways* (1889).

8. 2 *Political Science Quarterly* 223 (1887).

THE JOINT-COST THEORY

In 1891 Professor Taussig's well-known article, "A Contribution to the Theory of Railway Rates," appeared in the *Quarterly Journal of Economics*.⁹ This article, which had been read before the American Economic Association in December of the previous year, has exerted a great influence upon subsequent expounders of the theory of railway rates. Yet Taussig's explanation raised considerable controversy, and writers are still divided on the issues involved.

Professor Taussig makes railway rates a case of joint cost, explicable in the same way as the prices of wool and mutton, cotton fiber and cotton seed, and the various cuts of beef. "Railways present on an enormous scale," says Taussig, "a case of the production at joint cost of different commodities."¹ Joint costs exist, he says, "in any industry in which there is a large plant, turning out, not one homogeneous commodity, but several commodities, subject to demand from different quarters with different degrees of intensity."² Professor Taussig carefully analyzes railroad expenses, and finds a large quantity of general expenses which cannot be assigned to particular units of traffic except upon an arbitrary basis. He speaks approvingly of Sax's classification of expenses into "special" and "general." After referring to the findings of Sax that three-quarters of the expenses of a railway are independent of the items of traffic, he adds: "In other words, by far the largest part of the cost of performing railway service is joint cost."³ Having shown that a large part of the expenses of a railroad are joint, Taussig proceeds to apply the traditional theory of joint cost to the case at hand.

"We may continue to assume . . . the conditions of free competition: that the total receipts of a railway will no more than repay the expenses — return to capital being included among the expenses. Total receipts will then equal total cost. But that cost will be distributed among the different items of

9. 5 Q. J. E. 438.

1. *Ibid.*, p. 453.

2. *Ibid.*, p. 443.

3. *Ibid.*, p. 448.

traffic according to the nature of demand. Coal, lumber, ores, will be offered for transportation only if rates are so low that, if they were applied to the whole traffic, the enterprise would not pay. Nevertheless, if these articles yield anything over the separate expenses incurred for them alone, the road will take them, because the other expenses are incurred for the traffic as a whole, and will not cease if the heavy traffic is given up. Other goods, of greater value in proportion to bulk and weight . . . will be charged rates which, if applied to the traffic as a whole, would yield very high profits for the enterprise."⁴

In the latter part of his article, Taussig shows that the element of monopoly enters railway affairs, and the railway can exact monopoly prices on portions of its traffic. He believes, nevertheless, that in the main the classification of freight is to be explained by the joint-cost theory.

So far as the writer is aware, the term "joint costs" did not enter the discussions of railway rate theory before the publication of Taussig's article.⁵ Throughout this review, Taussig's explanation of railway rates will be referred to as the joint-cost theory. But it must be recognized that Taussig did not offer his explanation in any sense as a rival of the older theory. He was trying to put the theory, which had been developed largely by engineers, accountants, and railway officials, into its proper place in relation to economic theory. In a sense, Taussig was merely stating the older theory in a different terminology. Railway rates were no longer to be a special case not explainable in terms of the theory of value, but were to be recognized as another example of values when goods are produced under conditions of joint supply. Taussig

4. *Ibid.*, p. 454.

5. Hadley, it is true, had found an analogy to charging what the traffic will bear in the case of an industry which sells a by-product for what it will bring (*Railroad Transportation*, p. 113n), and Dupuit had discussed, as analogous to railway rates, the prices of theatre seats, a case which involves joint costs (17 *Annales des Ponts et Chaussées*, 2d series, 223). Marshall had hinted that railway rates were a case of joint costs in the first edition of his *Principles of Economics* (1890, p. 437). But railway rates had not definitely been explained in terms of joint cost prior to Taussig's article.

makes this clear in the concluding sentence of his paper. "Railway rates need not be detached from the general phenomena of exchange and set apart as explicable only on grounds of their own; and the main object of the present paper is to make some contribution towards determining their proper place in the theory of value."⁶

EARLY CRITICISM OF THE JOINT-COST THEORY

Mild criticism of the joint-cost theory is contained in the comments of a number of economists who discussed Taussig's explanation of railway rates.

One criticism advanced against the joint-cost theory was that the analogy between railroad rates and the prices of such joint products as gas and coke, or wool and mutton, is not perfect. In 1897 the English authority, W. M. Acworth, pointed out that the joint-cost analogies failed in one important point. He then showed that the transports of different commodities are not necessarily produced together, in the sense that an increase of one increases the production of the other. "To so much mutton belongs roughly so much wool. A ton of coal produces as of course so much coke and so much gas. You may no doubt breed primarily for mutton or primarily for wool. If gas is your main object you may disregard the deterioration in the coke from which the last cubic foot of gas has been extracted, while at a Durham coke-oven you may act upon the opposite principle. But the limits within which the one product can be produced at the expense of the other are tolerably narrow. Not so with a railway. Railways turn out what we may call a large number of commodities in variable amounts, some of them, moreover, being mutually exclusive."⁷

The same point was made by M. O. Lorenz in 1907, but he minimizes the criticism by saying that "in practice the objection may not be of much importance."⁸ "Gas and coke," Lorenz observes, "are produced jointly in the sense

6. 5 Q. J. E. 438, 465.

7. "The Theory of Railway Rates," 7 *Economic Journal* 317, 322.

8. "Constant and Variable Railroad Expenditures and the Distance Tariff," 21 Q. J. E. 283, 289 note.

that one cannot be produced without the other, and, no matter how large the production becomes, both will continue to be produced jointly. The coke can never be turned into gas. The production of coke does not, in the long run, interfere with the production of gas. It is otherwise in the railroad business. For a long time the passenger service may seem a by-product, and so long the analogy referred to holds; but if we imagine a sufficient growth in the traffic, so that a line becomes congested, it is apparent that the existence of the passenger traffic prevents the running of more freight trains on that line. Then . . . neither service can be looked upon as a by-product of the other."⁹

A similar criticism was made by J. M. Clark in 1910, but Clark was willing to accept the broadening of the joint-cost concept to include railway rates.¹

F. Y. Edgeworth makes the same criticism of the joint-cost theory, and points out that an increase of one kind of traffic may render another kind of traffic more and not less costly, and the case becomes one of "rival production" instead of one in which the production of one commodity increases the production of another.² Lastly, we have the criticism of W. Z. Ripley, who, altho adhering to the joint-cost explanation, recognizes that the situation is not exactly like the classic examples.³

THE MONOPOLY THEORY

The second criticism which was made of the joint-cost theory was that the explanation of discriminating rates lies in the existence of monopoly. Those who take this position may be called adherents to the monopoly theory. The monopoly theory, however, is not inconsistent with the overhead-cost theory. In fact, some of the early writers who give an overhead-cost explanation assume the railroad is a

9. *Ibid.*

1. Standards of Reasonableness in Local Freight Discriminations, p. 25 note.

2. "Contributions to the Theory of Railway Rates," 21 *Ec. J.* 551, 563 (1911).

3. Railroads: Rates and Regulation (1912), pp. 67-68.

monopoly. The overhead-cost theory was principally evolved to set forth why the motive to discriminate was so prominent, and why discriminating rates were not necessarily harmful. Only secondary consideration was given to the reasons why a discriminating system of charges could be maintained. The joint-cost theory implied that the adjustment of rates according to demand was as inevitable as the adjustment of the prices of cotton fiber and cotton seed according to the conditions of demand. It implied that discrimination was as inevitable under a competitive system as under a system of monopoly. The advocates of the monopoly theory, however, maintained that discrimination could not endure in the face of real competition, and that the real explanation of discriminating rates lay in the existence of partial monopoly in the railway field.

E. R. A. Seligman was the first to criticize the joint-cost theory on the grounds that the explanation of discrimination was to be found in the existence of a monopoly. This criticism was offered in the discussion which followed the reading of Taussig's paper before the American Economic Association in 1890. "The railway is practically a monopoly," he said, "and therefore Professor Taussig's argument is really robbed of its chief merit." But he added: "In so far as railway prices are yet competitive prices, his principle may be applied."⁴ In other words, Seligman agreed with the joint-cost theory in so far as the railroads are competitive, but since they are not wholly competitive, but monopolistic, he felt that the theory did not fit the facts.

GROUPING OF WRITERS IN LATER YEARS

The criticism of the joint-cost theory did not come to a head until 1913, when the controversy between Professors Taussig and Pigou took place in the pages of the *Quarterly Journal of Economics*. It is interesting at this point, therefore, to classify the writers on railway rates who published between the appearance of Taussig's article and the Pigou-Taussig controversy. They may be grouped according to

4. 6 Publications of the American Economic Association 56, 58 (1891).

their apparent position regarding the theory of rates. The list is not complete. No attempt is made here to classify the French and German writers.

The first group gives essentially an overhead-cost theory. There is no mention of the joint-cost theory, and little attention to the question whether monopoly is or is not essential to discrimination. In this group we find: C. H. Cooley, "The Theory of Transportation," 9 Publications of the American Economic Association, 225 (1894); H. S. Haines, *American Railway Management* (1897); W. E. Weyl, "Causes Affecting Rates and Fares," 11 *Annals of the American Academy of Political and Social Science* 324 (1898); H. T. Newcomb, *Railway Economics* (1898); C. S. Langstroth, *Railway Coöperation in the United States* (1899); J. S. Eaton, *Railroad Operations: How to Know Them* (1900); T. M. R. Talcott, *Transportation by Rail* (1904); E. R. McDermott, *Railways* (1904); H. S. Haines, *Restrictive Railway Legislation* (1905); J. B. Clark, *Essentials of Economic Theory* (1907); S. O. Dunn, "Railway Freight Rate Making," 47 *Railway Age Gazette* 226 (1909); Logan G. McPherson, *Railroad Freight Rates in Relation to the Industry and Commerce of the United States* (1909); W. L. Webb, *Economics of Railroad Construction* (2d ed.) (1912).

The second group shows the influence of the joint-cost theory. Often the joint-cost explanation is given along with the older explanation based on the distinction between constant and variable expenses. In general, this group of writers is willing to accept the joint-cost explanation, altho it includes the writers who have suggested that the analogy is not perfect. In this group we find W. M. Acworth, *The Railways and the Traders* (1891) and his *Elements of Railway Economics* (1904), and his article on "The Theory of Railway Rates," 7 *Economic Journal* 317 (1897); M. M. Kirkman, *Railway Rates and Government Control* (1891), and also by the same author, *The Science of Railways*, vol. 8 (1904); H. T. Newcomb, "Observations concerning the Theory of Railway Charges," 9 *Yale Review* 286 (1900); Emory R. Johnson, *American Railway Transportation* (1903); W. C. Noyes,

American Railroad Rates (1905); J. M. Clark, *Standards of Reasonableness in Local Freight Discriminations* (1910); E. R. Johnson & G. G. Huebner, *Railroad Traffic and Rates*, vol. 1 (1911); S. O. Dunn, *The American Transportation Question* (1912); J. F. Strombeck, *Freight Classification* (1912); C. L. Raper, *Railway Transportation* (1912); W. Z. Ripley, *Railroads: Rates and Regulation* (1912). It will be noticed that certain writers appear in both the first and second groups. Seligman might be included in the second group since he considers the joint-cost theory applicable where there is competition, but since he minimizes the importance of competition in the railroad field he may be properly put in the third group.

The third group consists of those who emphasize the monopoly explanation. In this group, as we have noted, is Seligman. Here, likewise, is H. G. Brown, who altho developing an overhead cost theory, insists that discrimination is to be explained by monopoly, and that differential charging would disappear in the face of competition. His article, "The Basis of Rate-Making as Affected by Competition versus Combination of Railroads,"⁵ would seem to establish his position. In this group likewise appears F. Y. Edgeworth.⁶

One writer, S. C. Williams in *Economics of Railway Transportation* (1910), is unable to decide between the claims of the joint-cost theorists and the monopoly theorists. He finds neither theory acceptable; not the monopoly theory, because there is some competition between railroads; not the joint-cost theory, because competition should reduce rates on different articles to uniformity in so far as costs are the same.

The most conspicuous advocate of the monopoly theory was A. C. Pigou, who took issue with the joint-cost explanation of rates in *Wealth and Welfare* (1912). The same criticism is also found in *Economics of Welfare* (1920). Pigou's criticism of the joint-cost theory precipitated the debate with Taussig in the pages of the *Quarterly Journal of Economics*.⁷

5. 16 *Yale Review* 79 (1907).

6. "Applications of Probabilities to Economics," 20 *Economic Journal* 441 (1910), particularly p. 460.

7. 27 *Q. J. E.* 378-384; 535-538; 687-694 (1913).

THE ATTACK UPON THE JOINT-COST THEORY

(1) The first criticism of the joint-cost theory is based on the contention that there must be two or more products or services produced together before joint costs can appear, and that a railway provides a single homogeneous commodity, namely, transport. Taussig himself had stated that when a large plant produces one homogeneous commodity, like steel rails or plain cotton cloth, joint cost does not exist. Taussig considers that a railway produces a variety of commodities (services in this case) while Pigou maintains that a railway produces a single homogeneous commodity — ton-miles. "The fact that some 'carrying of tons' is sold to copper merchants and some to coal merchants does not imply that two different services are being provided, any more than the fact that some plain cotton cloth is sold in England and some is sold abroad implies that two different commodities are being provided."⁸ "The popular acceptance of the contrary view," says Pigou, "can only be due to the fact that we happen to speak of 'transport of copper' and 'transport of coal,' instead of speaking of transport sold to copper merchants and transport sold to coal merchants," and, he adds, "an accident of language has caused an important field of economic inquiry to be dominated by a doctrine which is essentially unsound."⁹ Taussig replies that transport of copper and transport of coal may be alike in a physical sense, but they may be considered as two different services, since the two sorts of transport are sold to different customers and the demand schedules are different. On this point Taussig seems to have the better of the argument. Lack of homogeneity may not be due to physical differences in two commodities but to a difference in the demand for them. Usually the two things go together, but not always. Units of electricity are alike in a physical sense, but the demand for electricity for lighting and for power is different, and the two may be considered two commodities. Pigou finds it possible to continue his argument

8. Pigou, *Wealth and Welfare*, pp. 216-217.

9. *Ibid.*, p. 217.

even if he grants Taussig's contention as to the "twoness" involved in the transport of copper and coal. For the purposes of the argument, therefore, he concedes the point and the argument shifts to other ground.

(2) The second criticism of the joint-cost theory relates to the question whether discrimination can continue in the face of competition, or whether an element of monopoly is necessary. If railway rates are truly subject to the law of joint costs, competition will not destroy discriminating rates. All the competition imaginable would not cause equal prices on cotton fiber and cotton seed, nor on wool and mutton, nor on gas and coke. But competition among railways, it is argued, will cause discrimination to disappear.¹ This is the position taken by Pigou. He states his argument as follows: "If there are a number of competing sellers supplying transportation or anything else to several markets with separate demand schedules, and if the price in one of these markets is higher than in another, will it not be to the interests of any seller to transfer his offer of service from the lower-priced market to the higher-priced one? Will not this process ultimately bring prices in the different markets to a level, and will not the initiation of the process be wholly independent of the question whether or not supplementary costs are large relatively to prime costs? To my mind the answer is clearly in the affirmative."² Taussig disagrees with this view but does not make a convincing argument.³

The earlier literature on railway rate theory contained some thoughts that would seem to have a bearing on this subject. Many writers, and Hadley is a conspicuous example, had pointed out that under conditions of competition, railroad rates tend to be lowered to direct or prime costs, and that for this reason competition is ruinous, and some form of restriction is necessary if the railroads are to continue to operate.

1. It is recognized, of course, that the differences in rates which are based on differences in cost of service would continue in the face of competition.

2. 27 Q. J. E. 691.

3. 27 Q. J. E. 537.

Here is double support for Pigou's contention: first, in the statement that railway rates tend to be reduced by competition to prime costs, which, of course, would make differential charging disappear; and second, in the implication that enough restraint on competition is secured to prevent competition from being destructive. For if railways can control competition enough to prevent ruinous competition, they can control it enough to prevent competition from equalizing rates.

The French authority, Colson, maintained in 1890 that competition between railways makes differential rates disappear. "The customers," he said, "go . . . to whichever of the competitors offers the lowest rates." "Moreover, it is in the interest of each of them to attract the competitive traffic by offering lower rates than the others, provided each ton he secures pays more than it costs to transport it. The price of such act of conveyance then necessarily approaches the additional net cost."⁴

H. G. Brown, in 1907, pointed out that competition would make impossible the fixing of rates according to the value-of-service principle.⁵ He maintains that competition would reduce rates to equality, and would distribute fixed expenses in proportion to direct costs. Brown is evidently thinking of what might be called the effects of normal competition, rather than competition of the ruinous type which occurs unless restrained in some way.

C. F. Bickerdike is one of the few writers who argue that competition would not equalize rates. He is apparently of the opinion that if the law of increasing returns operates, competition will not equalize rates because capacity outruns the needs of the most profitable traffic. He cites the case of ships desiring a full cargo, and says that competition for the high-grade traffic will not reduce rates to cost because there is not enough high-grade traffic for all ships.⁶ It is possible that

4. *Transports et Tarifs* (1890). Travis translation, pp. 28-29.

5. "The Basis of Rate-Making as Affected by Competition versus Combination of Railroads," 16 *Yale Review* 79.

6. "Monopoly and Differential Prices," 21 *Ec. J.* 139 (1911).

boat lines would not actively compete for high-grade traffic if there was not enough of it to be concerned with, but it is difficult to see why in the presence of active competition, which assumes a desire for the traffic, rates would not be brought down to the lowest point at which it is profitable to take it.

The failure to accept the conclusion that differential pricing is impossible under conditions of perfect competition is probably due in part to the realization that we have, on railroads today, both competition and differential charging. And no one wants to maintain a theory that is contrary to the facts. But competition is rarely perfect and the degree of control over competition necessary to permit differential charging is slight. The monopoly theory, in other words, has frightened away those who recognize that railroads are not complete monopolies. The theory might have had more advocates if it had been stated differently. If instead of saying that discrimination implies monopoly, we had said that discrimination implies restrictions on competition, the theory might have been more acceptable. The degree of restriction necessary to prevent competition from becoming ruinous, is probably sufficient to maintain discriminating rates. The very fact that in the United States the freight classifications are made by classification committees and not by individual railroads, and that traffic associations exert a considerable influence in the adjustment of rates, implies enough concerted action in rate making to prevent the reduction of rates to an equality.

Recent events in connection with the development of motor transportation lend support to the contention that freight classification cannot be maintained in the face of genuine competition. We are witnessing what threatens to be a break-down in long-established classifications as a result of motor-truck competition. Where the motor trucks have adopted the railroad freight classifications or base their rates on rail rates, it is possible for the rail classifications to stand. Elsewhere, a breakdown in classifications is proceeding apace. It takes various forms. One is for the railroads to grant

special rates on mixed freight, in carload lots, regardless of the commodities included. A general merchandise rate of this sort was put into effect in 1930 between Portland, Oregon, and Seattle, Washington.⁷ In 1931 a number of eastern railroads established a similar rate on all freight, with certain exceptions, in mixed carloads on a basis slightly higher than fifth-class rates.⁸ Another device showing the same trend is found in connection with the "container service" adopted by a number of railroads. Here the rate is on the loaded container, altho goods of many different classes may be included. When the Interstate Commerce Commission authorized the New York Central and other railroads to make rates on this basis, it attached a condition that in no event should the rate on the loaded container be less than the carload rate on the highest-rated commodity loaded in the container.⁹ This was an effort to protect the existing classification of freight. On June 25, 1932, the carriers filed an application with the Commission to reduce the rates further on goods in containers, and to permit this rate to apply regardless of the fact that the container might be loaded with some high-rated articles. The carriers alleged that this measure was necessary in order to meet truck competition. Motor-truck competition will not entirely destroy the classifications. Much of the low-grade traffic moves at such low rates that the trucks cannot compete. The railroad's monopoly of this traffic is therefore unaffected, and it will be able to differentiate between such commodities on the basis of the demand for the service.

Commissioner Eastman of the Interstate Commerce Commission has recently expressed himself as doubtful of the ability of the railroads to continue the practice of varying their charges according to the value of the commodities in the face of motor-truck competition. This system, he points out, could be maintained when the railroads had more or less of a

7. George J. Flynn, *Coördination of Motor Transportation*, 72d Cong., 1st sess., Senate Document No. 43 (1932), p. 72.

8. *Ibid.*

9. 173 I. C. C. 377 (1931).

monopoly of the traffic.¹ The illustration given here is one in which a new agency of transportation is competing with the railroads as a whole; but the same result would ensue from real competition between individual railroads.

(3) The third count against the joint-cost theory is that true jointness exists only when the production of one commodity necessarily results in the production of another. This is the criticism advanced earlier by Acworth, Lorenz, Edgeworth, Clark, and Ripley. Of course if some extra expense needs to be incurred to finish the by-product or to put it on the market, the product will not be brought to the final stages or put on the market unless the price will cover the extra expenses involved in the process. "Two products are supplied jointly," says Pigou, "when a unit of investment expended upon increasing the normal output of one *necessarily* increases that of the other also."²

That the two products must be produced together, in the sense that increasing the production of one necessarily increases the other, was essential in the explanation of the prices of cotton and cotton seed, gas and coke, wool and mutton, and other classic illustrations of joint cost. There it was the increase in the production of one of the joint products, when there was no demand for it, following an increase in the demand for the other product, that distributed joint costs according to conditions of demand. This force cannot operate unless the quantity of one product varies to some extent with the other. Taussig, however, would broaden the term "joint cost" to include overhead expenses. "I submit," he says, "that the principle of joint cost may be applicable even tho a supply of one thing does *not* necessarily entail the supply of another."³

The overhead or constant expenses of a large establishment putting out diverse products are "joint costs" to Professor

1. Testimony in Hearings before the Committee on Interstate and Foreign Commerce, House of Representatives, 72d Cong., 1st sess. on H. R. 7116 and 7117, to amend Section 15a of the Interstate Act (1932), pp. 460-461.

2. *Wealth and Welfare*, p. 215.

3. 27 Q. J. E. 693-694.

Taussig. To Professor Pigou they are "common costs," but not "joint costs." This is not a mere quibble with words. The forces which distribute the expenses according to conditions of demand are not the same in the two cases. In the case of "joint supply" in the older sense, it is the increase in the production of one product without any increase in the demand for it that adjusts prices to demand. In the case of overhead costs, the force distributing the common costs according to demand is the desire to utilize a plant to capacity. Discrimination of the latter type begins to disappear when unused capacity disappears, for then the various products produced in the same establishment compete with one another. J. B. Clark has shown very clearly how rates are raised on low-grade commodities, when they begin to interfere with the movement of the more profitable traffic.⁴

The contrast between the two types of discrimination may be made clear by illustration. An increase in the supply of cotton necessarily increases the supply of cotton seed, and tends to reduce its price. An increase in the transportation of coal has no effect upon the transportation of other commodities, unless the line is congested, in which case it will tend to raise rather than lower the rates on less profitable traffic. If the line is not congested, the increase in the coal traffic will not affect the rates on the other traffic at all. The only force that could possibly bring about a reduction in such a case is the increase in the profits of the railway sufficient to attract new capital into the field. But it is commonly recognized that the flow of capital into and out of the railroad business does not operate to establish a normal return in the industry. In the long run, it might, but the long run is so long absolutely that the force is not a regulator of rates in any practical sense. But even if the flow of capital into and out of the industry took place readily, and this force brought about a reduction in the rates on certain commodities because the transportation of other commodities had increased, the force would not be the same as that which operates in the case of true joint

4. *Essentials of Economic Theory*, pp. 414 and 423-424.

cost. An increase in the demand for cotton fiber will increase the supply of cotton seed and reduce the price of it, whether the industry as a whole is making more or less than a normal profit. In other words, the adjustment of prices according to demand is not wholly dependent on the adjustment of profits to a normal level.

Economists have, and should have, the right to use terms in the sense that best brings out their thought. The obvious similarity between discrimination to utilize plant capacity, and discrimination in the case of the necessary production of two commodities together, justifies the use of the term joint-cost in a broad sense, if writers wish to do so. To the present writer, however, it seems that there is sufficient difference in the two situations to warrant a difference in terminology, and to confine the term "joint cost" to its earlier and narrower meaning.

(4) The fourth criticism of the joint-cost theory is its inadequateness. It cannot explain all types of discrimination. In fairness to Taussig it should be said that he constantly reiterated that the joint-cost theory did not explain all the peculiarities of railroad rates. "Classification (whether of passengers or freight) is the one special phenomenon explained, and doubtless to be justified, on the ground of joint cost. Rates made without regard to distance, or varying inversely to distance (the larger rate on the shorter haul), are not ordinarily so to be explained or justified."⁵ Thus Taussig recognizes that local discrimination is not to be explained by joint costs. Certainly no one could argue that personal discrimination was to be explained on the basis of joint costs. But why should freight classification (discrimination between commodities) be explained by one theory, and other types of discrimination by another theory? All types of discrimination proceed from the same fundamental cause. Any theory of rates that cannot explain them all is an incomplete theory.

5. 27 Q. J. E. 379.

THE SPECIAL CASE OF BACK HAULS

Even the most severe critics of the joint-cost theory recognize that joint costs are not entirely lacking on railroads. Pigou considers back hauls a case of joint costs. "The organization of a railway or steamship company requires that vehicles running from A to B shall subsequently return from B to A. The addition of a million pounds to the expenditure on moving vehicles necessarily increases both the number of movements of vehicles from A to B and the number of movements from B to A. This implies true jointness."⁶ A discussion of this point may throw additional light on the difference between mere "common" expenses, and joint expenses. Professor Taussig says back hauling is no different from the carrying of different commodities on the same railway generally. "Now, in back loading as in other cases where 'discriminating' rates are made, it cannot be said that a railroad 'necessarily' puts on the market a supply of one kind of service when it supplies another kind. There are always some separable expenses; and these set the minimum charge for the particular service. For example, in the case of back loading, there are the terminal expenses and the extra cost of hauling a loaded train over that of an empty one. A railroad does not necessarily put freight into its empty return cars."⁷ Haney likewise says: "it is cars that have to be hauled back, not freight, and the railway *could* keep on making up trains at B merely to get its equipment back to a sole source of traffic at A."⁸ In connection with these criticisms of Pigou's position, two things should be said. In the first place, the mere existence of some separate expenses in connection with the back haul is not important. There are separate expenses in the production of many joint products. If the market doesn't justify the extra expense it will not be incurred, and the by-product will be thrown away or never brought to a completed stage. In the second place, it is of

6. *Wealth and Welfare*, p. 219, note.

7. 27 Q. J. E. 380.

8. "Joint Costs with Especial Regard to Railways," 30 Q. J. E. 233, 241 (1916).

course true that the railroad does not necessarily put freight into the empty cars hauled back over its line. That is because the railway provides a service and not a commodity. Of course there is no increase in the desire to ship goods on account of the unbalanced traffic. But as Edgeworth has observed, an increase of the traffic in one direction will, by reducing the marginal cost of moving traffic in the opposite direction, lead to a normal increase in the production of the latter.⁹

A number of other writers have taken the same position as Pigou. Douglas Knoop says that back hauls constitute a case of joint cost because the service in one direction is the necessary complement of service in the other. "A service of train in one direction implies a corresponding service in the opposite direction; the two services are joint products . . ."¹ J. M. Clark distinguishes between back hauls and other phases of railroad operations. "On a railroad, eastbound and westbound traffic are joint, because it is cheaper to produce them together than separately, regardless of the total volume of tonnage moved. But passengers and freight are not joint in the same sense, because it would be cheaper to carry them separately, letting one road carry nothing but passengers and others nothing but freight, if roads could get adequate traffic in this way."² "The savings of by-products," he observes, "are not the same as . . . the economies of utilizing a plant to its full capacity."³ Back-haul traffic is a true by-product. Back hauling is a case of complementary and not rival production. The more the traffic in one direction increases, the lower will fall the rates in the reverse direction. This type of discrimination can exist in the presence of competition, and it does not disappear with an increase in the total volume of traffic.

9. "Contributions to the Theory of Railway Rates," 23 *Ec. J.* 206, 218 (1913).

1. *Outlines of Railway Economics* (1913), p. 161.

2. *The Economics of Overhead Costs* (1923), p. 59.

3. *Ibid.*

DEFENDERS OF THE JOINT-COST THEORY

After the Pigou-Taussig controversy, a number of writers took up the pen in defense of the joint-cost theory. All of them, like Taussig himself, recognized that the concept of joint costs had to be broadened if railway rates were to be included. The first defender of the theory was E. R. Dewsnap, who suggested that "joint costs" should be defined as existing "whenever the total costs of production of two or more commodities produced together by a single plant are less than the sum of the costs of their separate production by separable plants."⁴

This is a clear attempt to broaden the definition of joint costs to include the overhead costs of a plant producing several different commodities. J. M. Clark might possibly consider Dewsnap's definition still too narrow to include overhead costs, for the transportation of the different commodities by rail could be done more cheaply if each railroad could transport a single commodity instead of many. Such specialization, however, cannot take place because there is not traffic enough of each kind.

Assuming, however, that Dewsnap's definition is broad enough to cover overhead costs, the question would still be, whether he is describing one thing, or two different things. If they are really different, as has been suggested in the preceding pages, there is little point in calling them by the same name.

Another defense of the joint-cost theory is made by L. H. Haney.⁵ Two of his arguments require comment. He maintains that railway rates under free competition would not be reduced to equality but that discrimination would continue. In reply to Pigou's assertion that competition would equalize rates because competitors would seek to supply the most profitable market for transportation services, Haney points

4. "Railway Rate Making," 4 *American Economic Review* (supplement) 86, 89 (1914). See also "Railway Rate Theory and Practice in the Light of Ripley's 'Railroads,'" 30 *Political Science Quarterly* 476, 487 (1915).

5. "Joint Costs with Especial Regard to Railways," 30 *Q. J. E.* 233 (1916).

out that the high-priced market, or most profitable market, is the one in which "rate minus expense" is the greatest. This depends upon the amount of expense, says Haney, and the expense cannot be ascertained because so large a part of the expenses is not assignable. But Haney seems to forget for the moment that we are interested here in prime costs, which are known or can be estimated, not in total costs. The most profitable market is the one which yields the largest contribution over the prime costs.

But Haney's main argument seems to be that the concept of joint cost must be enlarged to apply, not only when two products must be produced together in a physical sense, but also when it is economically necessary to produce them together. He distinguishes between primary and secondary jointness — terms used by Edgeworth.⁶ Wool and mutton are joint in the primary sense for one cannot produce mutton without growing a little wool. But secondary jointness is "such common production as is necessary as a condition of profit." Here one product can be produced without the other in a physical sense, but only at a loss. A store, Haney says, may find it necessary to take on a side-line in order to pay its rent. "The problem here is, not to get some gain from a physically necessary by-product, but to get some by-product to help meet an economically necessary expense."⁷ Here, "the idea of necessity lies in the fact that some distinct item of output or traffic must be taken on, if the business is to succeed under normal and legitimate competitive conditions."⁸

By this process Haney identifies discrimination to utilize full capacity, and discrimination which results from the physical necessity of producing two commodities together. But after all, is not discrimination resulting from the physical necessity of producing two things together different from discrimination resulting from the economic necessity of producing two things together to utilize a plant to better advantage?

6. "Contributions to the Theory of Railway Rates," 23 *Ec. J.* 206, 217-220 (1913).

7. Haney, *op. cit.*, p. 240.

8. *Ibid.*

Another writer defending the joint-cost theory is G. P. Watkins.⁹ Watkins identifies overhead costs and joint costs, asserting that "the economy of full utilization of product and capacity is the foundation of the significance of joint cost."¹ He recognizes that the older concept of joint-cost does not include overhead costs. "Possibly, because of some restrictive formal definition that distracts attention from functional similarity, one may refuse to call all cases exhibiting the characteristic results of this situation cases of joint cost; but this seems to the writer unessential."²

Watkins considers that discriminating rates could exist under strict competition. He admits that discrimination is easier when monopoly exists but believes that under competition, "a considerable degree of differentiation might still be developed."³ The only argument that he can bring to support his conclusion, however, is that a concern operating to capacity by reason of differential rates will be stronger competitively than one that does not. Of course, the plant operating to capacity will be stronger competitively than one that does not, and that is the reason why a competitor will make every effort to increase his output by reducing prices or rates to take business away from his rival. Pigou's reply to Watkins seems conclusive: "Reflection, however, shows that, when competition really prevails, seller A must always endeavour to undersell B by offering to serve B's better-paying customers at a rate slightly less than B is charging, and that this process must eventually level all rates."⁴

Watkins attempts to prove his contention by appeal to actual examples. "If we could find a branch of production requiring heavy investment in fixed and specialized capital where competition nevertheless ruled, and if we should find differentiation there practised in order to promote full utilization of plant, that situation would constitute the needed

9. "The Theory of Differential Rates," 30 Q. J. E. 682 (1916), and in *Electrical Rates* (1921).

1. 30 Q. J. E. 682, 690.

2. *Ibid.*

3. *Ibid.*, p. 691.

4. *Economics of Welfare*, p. 257 note.

crucial instance."⁵ Ocean freight rates, he holds, provide such a case, but here, it must be remembered, the existence of agreements and "conferences" is necessary to prevent ruinous competition, and by these means a degree of control over competition is secured which permits some differentiation. The other illustrations which Watkins discovers may be criticized on similar grounds — imperfect competition, or an element of monopoly.⁶

One way of compromising the disagreement between those who adhere to the broader and those who adhere to the narrower concepts of joint cost is to use the term in the broad sense, but by a sub-classification differentiate between the two cases. Such a compromise is attempted by Owen Ely.⁷ He distinguishes between joint production with fixed ratio, and joint production with variable ratio. The classic illustrations of joint production — wool and mutton, cotton and cotton seed — are examples of fixed ratio production, because it is not possible to vary the proportions of products to any great degree. Variable ratio production is such that the ratio of products can be easily varied. The railroad, of course, falls in this group. There is no hard and fast line between the two classifications. There is a certain degree of variability in nearly all cases of joint production. This attempt to distinguish between two sub-classes of joint production does not seem to be helpful. As long as it is not possible to produce one commodity without producing another to some extent, there is a case of joint costs. The degree of variability does not matter. But when there is no necessary relation whatsoever between the production of one commodity and the production of another, there is little to be gained by calling it a case of joint cost with variable ratio. The characteristic has completely disappeared which causes the peculiar adjustment of prices under joint supply.

5. 30 Q. J. E. 692-693.

6. See note 4, p. 201.

7. *Railway Rates and Cost of Service* (1924).

CLASSIFICATION OF RECENT WRITERS

The writers on railway economics since the Pigou-Taussig controversy may be grouped according to the explanation of rates which they prefer. The first group ignores the joint-cost theory and proceeds to demonstrate the principles of rate making according to the older formula which we have called the overhead-cost explanation. In this group appear A. M. Sakolski, *American Railroad Economics* (1913); A. W. Kirkaldy and A. D. Evans, *The History and Economics of Transport* (1915); E. J. Clapp, *Railway Traffic* (1917); C. E. R. Sherrington, *The Economics of Rail Transport in Great Britain* (1928). In this group also is E. R. Dewsnap, *Freight Classification* (1913), but we have seen that elsewhere Dewsnap defends the joint-cost theory.

A second group apparently accepts the joint-cost theory, for the members of the group make use of it in their explanations of rates. For the most part, this group finds it necessary also to develop the importance of the fixed or overhead expenses. In this group we find I. L. Sharfman, *Railway Regulation* (1915); E. R. Johnson and T. W. VanMetre, *Principles of Railroad Transportation* (1916); H. B. Vanderblue and K. F. Burgess, *Railroads: Rates, Service, Management* (1923); L. H. Haney, *The Business of Railway Transportation* (1924); N. B. Mehta, *Indian Railways: Rates and Regulations* (1925); W. T. Jackman, *Economics of Transportation* (1926); Philip Burt, *Railway Rates* (1926); S. R. Daggett, *Principles of Inland Transportation* (1928); E. R. Johnson, G. G. Huebner, and G. L. Wilson, *Principles of Transportation* (1928); K. C. Srinivason, *The Law and Theory of Railway Freight Rates* (1928).

The two groups just referred to do not discuss the question presented by the Pigou-Taussig controversy. A few writers have faced the problem and definitely accepted or rejected the joint-cost explanation. Eliot Jones in *Principles of Public Utilities* (1931) definitely aligns himself with the joint-cost theory.⁸ His earlier book, *Principles of Railway Transporta-*

8. P. 321 note.

tion (1924), and his article "Is Competition in Industry Ruinous?"⁹ had implied an acceptance of the theory. M. G. Glaeser in *Outlines of Public Utility Economics* (1927) likewise accepts the joint-cost explanation.¹

The group which definitely rejects the theory includes J. M. Clark, Douglas Knoop, and possibly H. G. Brown. Clark, in *Standards of Reasonableness in Local Freight Discriminations* (1910), had been willing to accept the joint-cost explanation, altho recognizing that it involved a broadening of the concept. In *The Economics of Overhead Costs* (1923) he expresses a preference for the older and narrower concept. He points out that when different products are put out by a single plant the products are not truly complementary and may become rivals. "Does the taking on of an extra hundred thousand tons of freight contribute toward facilitating the taking on of extra passengers in the same way that killing an added hundred steers for the sake of the meat contributes toward the production of more hides and other by-products?"² Douglas Knoop in *Outlines of Railway Economics* (1913) rejects the joint-cost theory for the same reasons that influenced Clark.³ H. G. Brown's criticism of the joint-cost theory is milder than that of the others in the group. He is content to point out that the analogy between railway rates and typical cases of joint production is not perfect.⁴ Brown's explanation of discrimination is strictly an overhead-cost explanation, and elsewhere, as we have seen, he recognizes that monopoly is essential to discrimination.⁵

A recent writer who would seem to be in this group, except for the fact that he is not writing about railroad rates, is T. J. Kreps, writing on "Joint Costs in the Chemical Industry."⁶ He carefully distinguishes between overhead costs and joint

9. 34 Q. J. E. 473 (1920).

1. P. 625 note.

2. P. 101.

3. Pp. 163-164.

4. *Transportation Rates and their Regulation* (1916), p. 9 note.

5. "The Basis of Rate-Making as Affected by Competition versus Combination of Railroads," 16 *Yale Review* 79 (1907).

6. 44 Q. J. E. 416 (1930).

costs. The former are non-distributable costs, he asserts, but not joint. "There occur in the manufacture of all chemicals certain expenses which do not vary with the units of output, which may be termed supplementary, indirect, fixed, or overhead costs, or burden." "How is one to know," he asks, "whether the undistributed costs are joint costs, or 'common' and 'allied' costs?" "If the products are rival products — that is, if by increasing the facilities for producing one of them, or one bundle of them, the facilities for producing the others are decreased, or not changed at all — then merely overhead costs are present. If, however, by increasing the facilities for producing the one, the facilities for producing the other are unavoidably increased somewhat, then joint costs are present."⁷

It is impossible to attempt here a classification of all economists according to their preference, expressed or implied, for the broad or narrow concept of joint cost. It is interesting to note, however, that altho Marshall suggests in his *Principles of Economics* that joint costs occur when two or more products are produced in the same plant with a large mass of supplementary expenses,⁸ in *Industry and Trade* (1920) he indicates a preference for the narrower use of the phrase "joint costs." "When two things, say locomotives and stationary engines, are made in the same works, and in a great measure by the same labour and plant, it is often said that their costs are 'joint'; but this term has a special historical association with groups of things, such as wheat and straw, which cannot be produced separately; and it seems better to speak of such groups as having 'common' or 'allied costs.'"⁹ And John D. Black distinguishes between the "joint-product relationship," and the "supplementary relationship" between different products of a business. The "joint-product relationship" covers the traditional cases of joint cost. The "supplementary relationship" exists when additional prod-

7. *Ibid.*, pp. 457-458. See also pp. 458-460 for other differences between joint costs and mere supplementary expenses.

8. 8th ed., p. 390.

9. P. 193.

ucts are produced to make fuller use of some incompletely utilized facilities of production — plant, and labor, for instance.¹

DISCRIMINATION NOT ALWAYS POSSIBLE

If we cannot accept the joint-cost theory as a wholly sufficient and satisfactory explanation of railway rates, we are left with the old overhead-cost theory and the monopoly theory. The overhead-cost theory was adequate to explain the motive for discrimination. It is the existence of a large group of fixed expenses which does not vary with the traffic that makes differentially low rates profitable. It is better to take the traffic at low rates than not to take it at all if the rates make some contribution to the fixed overhead.² The overhead-cost theory, however, did not explain why discrimination was possible. Here the monopoly theory enters. Discrimination is not possible, however strong the motive, unless competition is brought under control.

But the monopolist, with complete control over his product, is not always able to discriminate. A second condition is necessary if discrimination is to be successful. The demand price for one unit of product must be independent of the price at which other units are sold. This point receives the most extended discussion by Pigou;³ it receives some recognition by Douglas Knoop;⁴ it is recognized as essential to discriminating rates by J. B. Clark.⁵

It can easily be seen that the demand for the transport of one commodity is largely independent of the price at which the transport of other commodities is sold. If one has wheat to ship and finds that the rate on coal is less, he does not pur-

1. Introduction to Production Economics (1926), pp. 205-207.

2. Even if all costs were variable, a monopolist would discriminate, if he could, by charging more than cost where possible, but he would never charge less than cost. But the characteristic feature of overhead-cost discrimination is the existence of prices below cost provided only prime costs are covered. Discrimination of the latter type finds its motive in overhead costs and unused capacity.

3. *Wealth and Welfare* (1912); *The Economics of Welfare* (1920).

4. *Outlines of Railway Economics* (1913), p. 155.

5. *Essentials of Economic Theory* (1907), p. 413.

chase coal transport instead of wheat transport. As Pigou has said: "the provision of the service of transport at different rates to coal merchants and to copper merchants does not lead to any copper merchants, for the sake of cheap transportation, becoming coal merchants."⁶ Transport from A to B and from C to D are quite independent, and a higher rate from A to B will not result in substituting shipments from C to D.

Some railroad services, however, are so related that the demand price for one service is affected by the price at which another service is sold. If two commodities are competitive it may be that a higher rate on one diminishes the demand for the transportation of that commodity, and increases that of the other. This is why competing commodities very frequently take the same rates. Similarly, a high rate on a raw material and a low rate on the finished product made from it will increase the demand for the transport of the latter and decrease the demand for the transport of the former. And if A and B are two rival producing centers, and M is a common market for the product, a higher rate from A to M than from B to M will cause the demand for the transport from B to M to increase at the expense of that from A to M. To a large extent, however, the demand for one transportation service is independent of the price at which other services are sold. If this were not true, discrimination would be impossible.

II. DISCRIMINATING RATES CRITICALLY CONSIDERED

A considerable portion of the literature on railway rates is concerned with the question of justification. In general, two distinct schools of thought are found: one which upholds the practice of charging "what the traffic will bear"; and another which condemns the practice and which advocates cost of service as a basis of rate making. It is not easy, however, to classify writers according to the school to which they belong. Some of those most out-spoken in favor of the cost-of-service principle are found, in the end, to admit that the value-of-

6. *The Economics of Welfare*, p. 242.

service principle has a place. And others, who defend the practice of charging what the traffic will bear, insist that cost of service should act as a check on the other principle. A combination of the two principles is rarely worked out with any definiteness, and all too often the matter is left with a few vague generalities to the effect that both principles should be observed. It will be convenient to consider first the criticisms directed at the system of differential charging.

DO PREFERENTIAL RATES BURDEN OTHER TRAFFIC?

The most common criticism of discriminating rates is that they throw an additional burden on traffic not favored. The low rates on low-grade traffic are alleged to result in higher rates on other traffic. A corollary to this proposition is that the low-grade traffic is subsidized, that is, that the high-grade traffic is paying part of the cost of moving low-grade traffic.

This view is taken by H. W. Edgerton, writing in the *Harvard Law Review*. "Doubtless the rates for some particular services might be fixed below cost; but, if capital were still to be attracted into public utilities, it would be necessary to allow such high rates at other points in the schedule as to make the aggregate return satisfactory. The favored consumers would be parasitic on other consumers; . . ." ¹ He defends his position as follows: "If A wants a thing and is prepared to pay its cost, there is . . . no reasonable excuse for refusing to let him have it. It is perfectly inequitable to charge him more than its cost in order that a different thing may be furnished at less than cost to some one else." ² And as to the traffic which he considers to be subsidized, he says: "traffic which will not bear the cost of carrying it ought not to be carried. Its owners have no vested right to live at other people's expense, and that is what happens if they pay only part of the cost of their service while the utility collects the rest from others." ³ It is clear that Edgerton believes that

1. "Value of the Service as a Factor in Rate Making," 32 *Harvard Law Review* 516, 544-545 (1919).

2. *Ibid.*, p. 545.

3. *Ibid.*

the low rates on some traffic throw a burden on other traffic. M. B. Hammond in *Rate Theories of the Interstate Commerce Commission* (1911) makes a statement which suggests similar views. "To make charges less than cost would mean that other commodities or other industries would have to make up the deficiency, or else the railroads of the country would run at a loss."⁴ It is true, of course, that if some traffic is carried at less than the average cost of service, some must be charged more than the average. But the rates on the high-grade traffic would be even higher if low-grade traffic, which will only bear low rates, were not carried at all.

The fallacy of assuming that the low rates on low-grade traffic throw a burden on other traffic was pointed out by the earliest writers on railway rates. Two conditions, however, must be fulfilled before preferentially low rates are justified. The rates must cover the direct or prime costs involved in handling the traffic, and the low rates must be necessary to enable the traffic to move. Over and over again this situation has been explained, but it seems to be something that is never learned by large masses of the public. This fallacy is the basis, for instance, of the constantly recurring demand for a rigid long-and-short-haul clause, that is, for one that permits no exceptions.

It can easily be shown that in many cases a railroad could not exist at all without differential charging. In other words, at any uniform rate, the traffic would be so small that the railroad would not pay. In such a case it is clearly advantageous to permit differentially low rates on low-grade traffic. Pigou confines his approval of discriminating rates to circumstances of this sort.⁵ But even if the railroad could exist and secure an adequate return from high-grade traffic, it might by differential charging increase the volume of its traffic, and so reduce the rates on other traffic.

"Those who object to the principle of value because it unduly raises the charges on high-class and local business," says Seligman, "thus utterly fail to perceive that in many

4. P. 187.

5. 27 *Quarterly Journal of Economics* 688-689; 692 (1913).

cases it produces just the contrary effect."⁶ So often has this been pointed out that citations are hardly necessary. In fact most economists are scornful of the other view. Acworth, referring to a claim made by a writer in a prominent British journal that English railroads were carrying coal at a loss and only avoiding bankruptcy by extortionate rates on other traffic, dismissed the claim with the assertion that "his arguments deserve as respectful consideration from railway economists as a dissertation to prove that the sun goes round the earth would deserve from astronomers."⁷

Sometimes even the defenders of differential charging make statements which imply that the low rates necessitate increased charges elsewhere. Albert Fink, in 1875, said: "It may therefore become necessary to charge on some articles less than the full cost of transportation in order to enable it to be moved at all; and this necessitates again to charge more on others which can bear higher charges."⁸ Such a statement invites the retort: why should traffic be moved that cannot pay its cost; why should it be subsidized by higher charges on other traffic? H. S. Haines also implies that the burden is shifted to valuable commodities in order to prefer the less valuable when he says that "the extra charge on the more valuable commodity enables the company to charge proportionately less profit on the cheaper and more necessary commodities."⁹ How much better it would have been to state that the low charge on the less valuable commodity enables the company to reduce rates on the more valuable commodities. S. C. Williams also refers to the "higher charges for non-competitive descriptions (of traffic) paying for the low charges made for what was competitive."¹⁰ This does, unfortunately, sometimes happen, but our system of regulation makes every effort to prevent it. Legitimate discrimination

6. "Railway Tariffs and the Interstate Commerce Law," 2 *Political Science Quarterly* 223, 250 (1887).

7. "Railway Mismanagement," 32 *Nineteenth Century* 938, 941 (1892).

8. *Cost of Railroad Transportation*, pp. 33-34.

9. *Restrictive Railway Legislation* (1905), p. 182.

10. *The Economics of Railway Transport* (1909), p. 215.

does not have this effect. Johnson and Van Metre are also defenders of discriminating rates, but they, too, say: "these low charges would not have been possible had not the less bulky articles of higher value paid more than their proportionate share of the total expenses of railroad transportation."² Undoubtedly the authors mean that if low-grade traffic pays less than the average cost of transportation, the high-grade traffic must pay more than the average cost, but it is easy for the critic to assume that the passage means that low rates on low-grade traffic have made the rates on high-grade traffic higher than they would otherwise have been.

Unfortunately, even the United States Supreme Court has fallen into the error of assuming that unless constant or overhead expenses, other than a return on capital, are equally distributed, a burden is cast on other traffic. In *Northern Pacific Railway Co. v. North Dakota*³ the Court held that rates fixed by the State of North Dakota on lignite coal were confiscatory because they did not cover the full cost of the service, including an apportionment of the non-variable expenses. The Court, speaking through Mr. Justice Hughes, laid down the following principle: "... we entertain no doubt that, in determining the cost of the transportation of a particular commodity, all the outlays which pertain to it must be considered. We find no basis for distinguishing in this respect between so-called 'out-of-pocket costs,' or 'actual' expenses, and other outlays which are none the less actually made because they are applicable to all traffic, instead of being exclusively incurred in the traffic in question. Illustrations are found in outlays for maintenance of way and structures, general expenses and taxes. It is not a sufficient reason for excluding such, or other, expenses to say that they would still have been incurred had the particular commodity not been transported. That commodity has been transported; the common carrier is under a duty to carry, and the expenses of its business at a particular time are attributable to what

2. Principles of Railroad Transportation (1916), p. 341.

3. 236 U. S. 585 (1915).

it does carry."⁴ We are not interested here in criticizing or defending this rule of law. But we are interested in the reasons stated by the Court for establishing such a rule. The reason is stated in the following language: "The state cannot estimate the cost of carrying coal by throwing the expense incident to the maintenance of the roadbed, and the general expenses, upon the carriage of wheat; or the cost of carrying wheat by throwing the burden of the upkeep of the property upon coal and other commodities. . . . Certainly, it could not be said that the carrier may be required to charge excessive rates to some in order that others might be served at a rate unreasonably low. That would be but arbitrary action."⁵ The Court, accordingly, lays down the following rule: "The outlays that exclusively pertain to a given class of traffic must be assigned to that class, and the other expenses must be fairly apportioned. It may be difficult to make such an apportionment, but when conclusions are based on cost, the entire cost must be taken into consideration."⁶

It is submitted that the reasons given by the Court for requiring an apportionment of constant costs are not wholly sound. It does not follow that because lignite coal, or some other commodity, contributes less than a pro-rata share of maintenance of way a burden is thrown on other traffic. It is quite possible that if charged a rate based on an apportionment of overhead expenses, the coal traffic would contribute even less, in the aggregate, toward the constant expenses. Perhaps the carrier is a better judge of that matter than the state, but it is clear that the power of the state to require differentially low rates is strictly limited by the rule. The carrier itself, however, has a legal right and may find it expedient to burden particular traffic with less than its share of the overhead. The principle of the *Northern Pacific Case* was followed in *Norfolk & Western Railway Co. v. Conley*, decided the same day.⁷ In this case the question involved the

4. *Ibid.*, p. 597.

5. *Ibid.*, p. 598.

6. *Ibid.*, p. 597.

7. 236 U. S. 605.

distribution of expenses between freight and passenger business. A later case, reaffirming the rule of the Northern Pacific Case, was *Banton v. Belt Line Railway*⁸ which involved charges for a special class of passengers — in this instance, transfer passengers.

These cases do not require a *uniform* contribution to "profit" from all classes of traffic, hence some opportunity for rate differentiation by the state is permitted. Were it not for this fact, no differentiation in rates, not based on cost, would be found in rates prescribed by the state. But the rule, even as it is, sometimes leaves regulatory authorities in a ridiculous position. When traffic falls off, leaving unutilized capacity, a wise management would consider the possibilities of full utilization by rate reductions and by further differentiation on the principle of charging what the traffic will bear. Regulatory authorities, however, are estopped from requiring any such rate readjustments by the Northern Pacific rule. A recent case involving this question was *California Growers' & Shippers' Protective League v. Southern Pacific Co.*⁹ Here the Commission refused to lower rates on fruit from California to points east, and said: "We must take notice of the general fact of the decline in the volume of traffic, affecting commodities generally; and of the familiar principle which operates in such circumstances to increase the cost per unit of performance of those items of outlay which are fixed and do not vary with traffic."¹ The Commission's reasoning is probably legally sound in view of *Northern Pacific Railway v. North Dakota*, but it is not economically convincing. The Court's fallacy in requiring a strict apportionment of overhead costs has been pointed out by R. L. Hale, one of the few legal writers to criticize the reasoning of the Court in the Northern Pacific Case.²

8. 268 U. S. 413 (1925).

9. 185 I. C. C. 299 (1932).

1. *Ibid.*, p. 340

2. "Non-Cost Standards in Rate-Making," 36 Yale Law Journal 56 (1926).

DOES CHARGING WHAT THE TRAFFIC WILL BEAR
LEAD TO MONOPOLY PROFITS?

The second major charge against discriminating rates and the practice of charging what the traffic will bear is that it leads to monopoly profits. By exacting the most profitable rate from each class of traffic, the railroad may secure larger profits, and absorb an unnecessarily large share of the social income. H. C. Adams, in 1893, had this in mind when he said that charging what the traffic will bear as applied by railway managers was indefensible. His position was that the principle was sound when applied "in such a manner as to assign total cost of carrying traffic to the various classes of freight carried, and not to the determination of a rate which will secure the largest aggregate income."³ Most economists admit the necessity of limiting the return which railroad companies shall obtain for their services. Eliot Jones, for instance, is careful to point out that the adjustment of rates on each individual commodity at the point yielding the maximum profit would be "indefensible and opposed to the public interest, since it would lead to unreasonable profits for the railway,"⁴ but that the principle is valid for redistributing total expenses when "receipts of the railway are equal to its aggregate costs."⁵ W. C. Noyes says: "A railroad is entitled to receive from all the rates together enough to pay expenses, and a fair return upon capital invested. It is not entitled to receive more because it is fulfilling a public function."⁶ And John Bauer, referring to public utility rates, says: "'What the traffic will bear' can be applied only to the relative ability of the different classes of consumers to share in the total joint costs chargeable to the public. It does not connote any profit element beyond the total costs of the

3. "Service of a Bureau of Railway Statistics and Accounts in the Solution of the Railway Question" (1893), in C. C. McCain, *Compendium of Transportation Theories*, p. 134.

4. *Principles of Railway Transportation* (1924), p. 88.

5. *Ibid.*

6. *American Railroad Rates* (1905), p. 25.

utility."⁷ So generally accepted is this view that further citation of references is unnecessary.

Spokesmen of the railways very frequently voice a contrary view. H. S. Haines argues that "If each specific rate be satisfactory as applied to each specific transaction, the scheme of rates is reasonable in its general application to the whole volume of traffic, and the public welfare has not been injuriously affected by it. Assuming the truth of this proposition, the field of investigation as to the reasonableness of rates should be confined to the reasonableness of each specific rate as applied to each particular transaction."⁸

Among economists the view is all but universal that the principle of charging what the traffic will bear should be restricted by limiting the total return of the railroad. Only a few economists hold otherwise. Hadley, in 1885, had cautioned against the attempts to limit profits of railroads, but he was not thinking of direct rate regulation, but of attempts at indirect regulation by limiting the rate of dividends. Such attempts at limiting profits had been found in early railway charters and early legislation. They were generally unsuccessful. As Hadley pointed out, they resulted in stock watering and in a tendency to increase salaries and expenses, and removed any incentive to increase income through reducing rates and increasing the volume of business.⁹ In his later years, Hadley made somewhat similar criticisms of the modern practice of measuring the reasonableness of rates by the earnings of the companies.¹ Hadley rested his contention largely upon the belief that it was in the interest of the railroads and public utilities to reduce rates to the lowest possible point, thereby increasing the volume of business and profits.

7. *Effective Regulation of Public Utilities* (1925), p. 280.

8. *Restrictive Railway Legislation* (1905), pp. 173-174.

9. *Railroad Transportation*, pp. 102-103; 126.

1. Hadley testified to this effect before the New York Commission on Revision of the Public Service Commissions Law. His testimony is described and criticized by James C. Bonbright in the minority report of the Commission. See the report of the Committee, *New York Legislative Document No. 75, 1930*, pp. 374-377.

Somewhat similar views have been expressed by Philip Cabot.² Cabot's main argument rests on the proposition that the interests of the consumer and of the utility are identical. He is much impressed by the elasticity of demand for public utility services. Elasticity of demand is due largely, he says, to the existence of substitute goods or services. If rates are high such substitutes will be used. It is in the interest of the utility to reduce rates to prevent resort to substitutes. Thus the utility is competing with the producers of alternative goods and services, and no monopoly exists. "If . . . experience proves that the market for public utility services is an elastic market, we know that it is a competitive market. . . . When a movement of price in either direction is followed by a change in the quantity bought, substitution has taken place and competition is at work."³ There is nothing new in the idea that elasticity of demand may make it in the interest of the monopolist to fix a low price on his product. Cabot is carried away with the idea, and considers that this circumstance will cause the utility to reduce prices to the lowest possible point. The importance of the element of substitution is not to be denied in connection with some public utility and transportation services. It undoubtedly has a new importance in connection with railroads since the construction of improved highways and the development of motor transportation have made individualized travel and transportation possible. But this fact should not lead one to suppose that the possibility of finding substitute services affords any great protection to all or even to a substantial number of the consumers of public utility and transportation services. This point has been brought out by H. M. Gray.⁴

An effective answer to the position of Hadley and of Cabot is presented by James C. Bonbright in the minority report of the New York Commission on Revision of the Public Service

2. "Public Utility Rate Regulation," 7 *Harvard Business Review* 257 and 413 (1929); "Four Fallacious Dogmas of Utility Regulation," 7 *Public Utilities Fortnightly* 719 (1931).

3. 7 *Harvard Business Review* 413, 414, 415.

4. "Competition as a Basis for Electric Light and Power Rates," 5 *Journal of Land and Public Utility Economics* 242 (1929).

Commissions Law. After acknowledging that the possibility of substitute or alternative services operates to limit the charges of public utilities, he says: "All of these factors, to be sure, operate to prevent a company from charging as much as it would otherwise be disposed to charge; they do not operate to prevent it from charging any more than it needs to charge in order to perform the service and to attract necessary capital for extensions and improvements."⁵ And in reply to the contention that low rates stimulate demand and increase profits, he says: "That, up to a certain point, this increased demand will more than make up for the loss of profits on any given amount of business has . . . been the experience of utility operators. But there is a point of maximum profits below which the increased business does not make up for the lower unit profits, and when this point is reached a company will not reduce prices further if it follows the policy of securing the largest returns for its stockholders."⁶ Bonbright is justified in his conclusion: "There is not the slightest ground in economic theory for supposing that this point of 'maximum profits' is the . . . point at which rates should be fixed in the *public* interest. There is no reason, indeed, why rates should not be still further reduced as long as they yield earnings sufficient to meet operating expenses and to pay a return to stockholders sufficiently large to attract the needed capital for extensions and improvements."⁷

The case for limitation of total earnings rests upon three arguments which may be stated very briefly. (1) Competition, if it could operate in the railway industry as a regulator of rates, would limit earnings to a fair return on capital invested. (2) A return sufficient to attract capital is all that is economically necessary to pay for transportation service. (3) The government could provide transportation service at cost. If so, why should the public pay more for transportation under private ownership of railroads? Some difficult prob-

5. New York Legislative Document No. 75, 1930, p. 375.

6. *Ibid.*, pp. 376-377.

7. *Ibid.*, p. 377.

lems are encountered in regulating rates on this basis, as everyone knows, but that does not detract from the soundness of the principle.

The regulation of the general level of rates on the basis of profits, is specifically sanctioned by the courts of the land. The familiar statement of the United States Supreme Court in *Smyth v. Ames* is sufficient proof of this point. "We hold, however, that the basis of all calculations as to the reasonableness of rates to be charged by a corporation maintaining a highway under legislative sanction must be the fair value of the property being used by it for the convenience of the public."⁸

A contrary view is sometimes argued.⁹ Dicta in some cases lend support to the contention that the reasonableness of rates is not to be measured by profits. Many of the cases seeming to support this view, however, relate to the reasonableness of particular rates. But the courts have repeatedly maintained that the reasonableness of particular rates does not rest upon the question of the amount of profit earned by the company. Thus the United States Supreme Court has said: "whether the carrier earned dividends or not sheds little light on the question as to whether the rate on a particular article is reasonable."¹ If the cases are eliminated which relate to individual rates, and not to the general body of rates, there is little left to support the conclusion that the reasonableness of the rates is not to be determined by the earnings of the company. The case most frequently cited in support of the contention is *Cotting v. Kansas City Stock Yards Co.*² wherein Mr. Justice Brewer said: "... the State's regulation of his charges is not to be measured by the aggregate of his profits, determined by the volume of business, but by the

8. 169 U. S. 466, 546 (1898).

9. See Nathaniel T. Guernsey, "Rate Making Powers under Commission Laws," Report of the American Bar Association, 1922, p. 637; "State Commission Laws Regulate Rates, Not Profits," 13 Virginia Law Review 257 (1927); "The Test of Reasonable Rates," 14 Virginia Law Review 1 (1927).

1. 263 U. S. 456, 482.

2. 183 U. S. 79 (1901).

question whether any particular charge to an individual dealing with him is, considering the service rendered, an unreasonable exaction. In other words, if he has a thousand transactions a day and his charges in each are but a reasonable compensation for the benefit received by the party dealing with him, such charges do not become unreasonable because by reason of the multitude the aggregate of his profits is large. The question is not how much he makes out of his volume of business, but whether in each particular transaction the charge is an unreasonable exaction for the services rendered. He has a right to do business. He has a right to charge for each separate service that which is reasonable compensation therefor, and the legislature may not deny him such reasonable compensation, and may not interfere simply because out of the multitude of his transactions the amount of his profits is large."³

But this pronouncement is far from being support for the contention urged. In the first place, Justice Brewer's opinion was not that of a majority of the whole court. Six justices concurred in the result but not on the grounds that brought forth Justice Brewer's comments. In the second place, Justice Brewer qualified his position by admitting that profits might be a factor in determining reasonableness. "Of course, it may sometimes be . . . that the amount of the aggregate profits may be a factor in considering the question of the reasonableness of the charges, but it is only one factor and is not that which finally determines the question of reasonableness."⁴ In the third place, Justice Brewer carefully excluded railroads from his rule, holding that a railroad was a business of a public character and the company was doing the work of the state. Here profits may be limited, he asserted, but the stockyards business, which was the business involved in the case, was not a public business, but only a business in which the public had "acquired an interest."⁵

If there is any doubt about the legal soundness of limiting

3. *Ibid.*, p. 95.

4. *Ibid.*, p. 97.

5. *Ibid.*, p. 93.

the return of a railroad it should be set at rest by the language of former Chief Justice Taft in *Dayton-Goose Creek Railway Co. v. United States*, upholding the constitutionality of the recapture provisions of the Transportation Act of 1920.⁶ It was there argued that a carrier was entitled to all it could earn when each particular charge it levies is reasonable. To this the Court said: "By investment in a business dedicated to the public service the owner must recognize that, as compared with investment in private business, he cannot expect either high or speculative dividends but that his obligation limits him to only fair or reasonable profit."⁷ And later in the same decision Chief Justice Taft says: "If the profit is fair, the sum of the rates is so. If the profit is excessive, the sum of the rates is so."⁸

VALUE OF SERVICE PRINCIPLE LEADS TO EXCESSIVE RATES ON
PARTICULAR COMMODITIES AND HAULS

The preceding discussion suggests another criticism and limitation on the practice of differential charging. Low rates on low-grade traffic were justified on the grounds that they contributed to the overhead expenses of the railroad and relieved the burden on other traffic. Low rates on low-grade traffic, it was said, make possible lower rates on other traffic than would be possible otherwise. But there is no force which compels the reduction in rates on high-grade traffic, unless it be the action of the state which controls the rates.

Seligman suggests that the value-of-service principle does not justify higher charges on the valuable goods than would be charged if low-grade traffic were not carried.⁹ To justify the exaction of the most profitable rate from the high-grade traffic simply because the traffic will bear it, is inconsistent with justifying low rates on low-grade traffic on the ground that they relieve the burden on other traffic. Stated in another way, price differentiation should be differentiation

6. 263 U. S. 456.

7. *Ibid.*, p. 481.

8. *Ibid.*, p. 483.

9. "Railway Tariffs and the Interstate Commerce Law," 2 *Pol. Sci. Quar.* 223, 250 (1887).

downward in favor of low-grade traffic, not upward to penalize high-grade traffic. This is evidently what Ripley had in mind when he said that the cost-of-service principle must be used as a check upon the value-of-service principle to prevent rates on high-grade commodities from becoming extortionate. "With all high grade traffic," he says, "the value of service principle fails utterly by itself alone to prescribe the upper level of a reasonable charge."¹ Ripley then proceeds to show that on many manufactured articles a very high rate is so small a portion of the price that the railroad could exact an extremely high rate before consumption of the article is affected, and that for necessities a substantial increase in price would not curtail consumption appreciably. On these commodities, some limitation other than the principle of charging what the traffic will bear is necessary. Ripley possibly forgets here that high rates may restrict the demand for the transportation of a commodity without restricting the demand for the commodity itself. A high freight rate might not check the consumption of an article to any appreciable extent, but it might greatly affect the transportation of the article. The high rate might lead to local production, or at least to the development of less centralized production centers. This is what Dewsnup had in mind when he criticized Ripley by saying: "Are we to suppose that the railways have deliberately neglected an obvious and easy opportunity of securing an appreciable increase of revenue? The unlikelihood of such a supposition induces one to believe that some powerful force has compelled the maintenance of rates on high valued goods at a comparatively low level. Without doubt a partial explanation at least is to be found in the territorial extensiveness of the market for the higher-valued products, permitting competition, particularly market competition, of special intensiveness."²

In spite of Ripley's exaggeration of the possibilities of increasing rates on high-grade traffic, he is right in recognizing

1. *Railroads: Rates and Regulation* (1912), p. 171.

2. "Railway Rate Theory and Practice in the Light of Ripley's 'Railroads,'" 30 *Pol. Sci. Quar.* 476, 504 (1915).

that the principle of charging what the traffic will bear, if unchecked by regulatory authorities, would lead to unnecessarily high rates on some articles. Dewsnap, however, maintains that there is no "logically acceptable criterion of the reliability of maximum rate schedules other than that of the effect upon demand."³

Some writers would not agree with our position, since they feel that as a matter of justice commodities which are valuable should pay high rates. Emory R. Johnson, for instance, has said: "To fix railway charges somewhat as taxes are levied — i.e., on the value of an article carried — would be an equitable method."⁴ The idea that it is a mark of justice in the rate structure to charge high rates on the valuable commodities has its origin in the supposed analogy between railway rates and taxes. Taussig long ago pointed out the weakness in this analogy. The valuable articles are not necessarily luxuries consumed by the rich, nor are cheap articles necessarily consumed by the poor. Hence there is no necessary relationship between the ability of commodities to pay high rates, and the ability of the consumers to pay a tax.⁵ Even if there were such a relationship, should not the state instead of a railway company levy the tax? On this point H. W. Edgerton's remarks are well worth consideration. "As to the value of the article, of which much is made in discussions of the value of the service, it is hard to see why the shippers of valuable articles are not as well entitled as the shippers of cheaper ones to be served at cost, including risk and a reasonable profit. There is no public policy against owning or shipping valuable articles, and consequently no reason for imposing a tax on their circulation. Even if and when it is well to impose a tax on the circulation of some things, as being harmful or luxurious, the tax should be collected by the state and not by utility companies."⁶ M. H. Robinson has suggested another reason why it is inadvisable

3. *Ibid.*, p. 504.

4. *American Railway Transportation* (1903), p. 276.

5. "A Contribution to the Theory of Railway Rates," 5 *Q. J. E.* 438, 438-439 (1891).

to charge rates in excess of the cost of service on articles of high value. Valuable articles, he points out, are frequently the ones whose quantity is strictly limited by nature, or which can be produced less easily than others, and "it would be a distinct economic gain to the community to have the rate of transportation low upon such goods."⁷ To impose a high rate upon these articles adds another difficulty to the difficulties imposed by nature to obtaining a plentiful supply of them.

If the principle of charging what the traffic will bear must be modified to prevent excessive rates on valuable commodities, it must likewise be modified to prevent a railroad from charging excessive rates on particular hauls. The railroad must be prevented from imposing unnecessarily high rates on industries and localities which have the most favorable costs of production. This is the situation, partly at least, which Commissioner Lane had in mind in *Advances in Rates—Western Case*⁸ when he said: "To make rates for transportation based solely upon the ability of the shipper to pay those rates is to make the charge for transportation depend upon the cost of production rather than upon the cost of carriage—to measure a public service by the economies practiced by the private shipper. This necessarily gives to the carrier the right to measure the amount of profit which the shipper may make and fix its rate upon the traffic manager's judgment as to what profit he will be permitted. This theory entitles the railroad to enter the books of every enterprise which it serves and raise or lower rates without respect to its own earnings but solely with respect to the earnings of those whose traffic it carries. This is not regulation of railroads by the nation, but regulation of the industries and commerce of the country by its railroads."⁹ M. H. Robinson has also pointed out that the principle of charging what the traffic will bear, if unre-

6. "Value of the Service as a Factor in Rate Making," 32 Har. Law Rev. 516, 547 (1919).

7. "Railway Freight Rates," 18 Yale Review 122, 147 (1909).

8. 20 I. C. C. 307 (1911).

9. Ibid., pp. 350-351.

stricted, would "completely nullify the economic rent of land so far as the farmers are concerned and convert it into an added profit for the railway service," and that it would enable the railways to "absorb all differential profits that arise from superior location and superior business management in every domain of business activity."¹

It is clear that the principle of charging what the traffic will bear ought to be restricted to the granting of low rates to commodities and localities that cannot pay normal rates. This does not mean that in cases of local discrimination all preferential rates are justified. They may work an injury to points not preferred.

ARGUMENTS OF COST-OF-SERVICE ADVOCATES

The major criticisms of the principle of charging what the traffic will bear have been considered, and certain modifications of, or limitations to, the principle have been recognized. There remain to be considered the positive arguments advanced by the advocates of the cost-of-service basis of rate making. We here meet the argument that each class of business should pay its own way; that no traffic should be subsidized, and that no traffic should be burdened with more than its share of the costs of service. "The charge on each article or shipment should cover the cost of transportation and contribute its just proportion of the interest on the investment," said Halford Erickson, a former member of the Wisconsin Railroad Commission.² And the Wisconsin Commission, upholding cost apportionments in *Buell v. Chicago, Milwaukee & St. Paul Railway Co.*, said: "The imposition of a tax on the users of one class of service for the benefit of those who use another is not consonant with reason or fair dealing."³ This argument, it will be observed, is none other than the argument which we have previously considered, namely, that low rates on some traffic throw a burden on other traffic, or that high

1. Op. cit., p. 126.

2. "The Basis of Reasonable Rates," 9 American Economic Association Publications (third series) 95, 100 (1908).

3. 1 Wisconsin Railroad Commission 324, 341 (1907).

rates on high-grade traffic subsidize the low-grade traffic. The argument does not need further consideration.

ARE COST ALLOCATIONS PRACTICABLE?

The most common argument advanced in behalf of basing rates on cost rests upon a belief in the marvels of cost accounting. Cost accounting has developed so rapidly and has proved so valuable in industry that its extension to the railroad industry is demanded. Its advocates believe that all railroad expenses can be scientifically allocated. The possibilities of cost accounting greatly impressed the Wisconsin Commission in the Buell case.⁴ The same argument has been made by B. H. Meyer in defending the cost-of-service principle.⁵ Enthusiasts for cost allocations are common among accountants and engineers, but not so numerous among economists. M. L. Cooke, in advocating cost accounting for railroads, has argued that it would provide a "scientific basis for freight and passenger rates." He believed that practically all costs could be allocated.⁶

Economists are generally of the opinion that expenses which do not vary with the volume of traffic cannot be allocated except upon some arbitrary basis. The fundamental fallacy in any apportionment of constant or overhead expenses lies in the fact that the cost depends upon the volume of traffic, and the volume of traffic depends upon the rate charged. Acworth showed the futility of trying to find costs by referring to the saying that "cost of carriage is a function of the rates, not the rates of the cost."⁷ It may be worthwhile to quote again the words of Belpaire, written in 1847, which were quoted in Part I of this review. "When one distributes . . . fixed expense over a quantity of work which is

4. *Ibid.*

5. "Memorandum Relating to the Analysis of the Operating Expenses of Railway Companies," 19 Proceedings of the National Association of Railway Commissioners 103 (1907).

6. "True Cost-Finding — What it Can Do for the Railroads," 86 *Annals of the American Academy of Political and Social Science* 205 (1919).

7. "The Theory of Railway Rates," 7 *Ec. Jour.* 317, 323 (1897).

essentially variable, it is clear that the result must be indeterminate; it will be the quotient of a division in which the dividend is constant, while the divisor can be big or little, can take any value."⁸ If an apportionment of overhead results in a rate which does not permit fullest utilization, profits may be lost which would result from a different rate. "Cost accountants," G. P. Watkins has pointed out, "are too likely to assume relations as fixed which may change as a result of prices based upon their cost analysis."⁹ Elsewhere Watkins suggests that rate making is a matter of "commercial policy," and cannot be made a matter of "physical facts and simple arithmetic."¹ Professor Cunningham has listed twelve methods of apportioning maintenance-of-way expenses between freight and passenger business.² He is not arguing, however, for the use of such apportionments in making rates. It can easily be shown that if any of the twelve methods suggested were used for adjusting rates, the volume of traffic might be altered, and if so, the basis of the apportionment would change with it.

One of the best expositions of the limitations on cost accounting is by Allen S. Olmsted. Two processes are involved in cost analyses, he says; one is "an *allocation* to a particular traffic of costs attributable solely to it, and the other is an *apportionment* between the particular traffic and other traffic of costs jointly caused by both kinds of traffic."³ These two computations are quite different, he argues. "One is allocation, which is the ascertainment of facts; the other is apportionment, which is the determination of policy. The former concerns itself with what is; the latter with what should be. . . . Allocation aims to find what each service costs; apportionment aims to determine what each service ought to pay."⁴

8. *Traité des Dépenses d'Exploitation aux Chemins de Fer*, p. 49.

9. "The Theory of Differential Rates," 30 Q. J. E. 682, 697 (1916).

1. *Electrical Rates* (1921), p. 105.

2. "The Separation of Railroad Operating Expenses between Freight and Passengers," 31 Q. J. E. 209, 225 (1917).

3. "Do 'Cost of Transportation' Exhibits in Railroad Rate Cases Show Cost," 63 *Annals of Am. Acad.* 214 (1916).

4. *Ibid.*, p. 218.

Most economists are inclined to consider cost allocations as unsound in principle. Hadley stated that an apportionment of costs results in "a false and arbitrary return which is worse than none at all."⁵ Taussig said that cost allocations as a basis for fixing or criticizing railway rates were "useless and indifferent alike for the railway manager and for the student of economics."⁶ G. P. Watkins says: "All costs certainly can be apportioned. But that fact of itself is no more significant than is the possibility of obtaining an arithmetical average of any fortuitous collection of numbers."⁷ And Philip Cabot, in speaking of cost allocations, says: "They suffer from an incurable disease, namely, the attempt to divide the indivisible . . . To allocate the costs of a utility is as futile and dangerous as it would be for a butcher to allocate the cost of the different pieces into which he cuts the carcass of a cow."⁸

The advocates of cost apportionment, however, argue that basing rates on cost of service is the only "scientific" way of making them. But nothing could be more unscientific than an attempt to base rates on cost in disregard of the conditions of demand. But cost accounting is not to be wholly condemned in connection with rate making. Sometimes cost studies reveal causal relationships between traffic and expenses that are not obvious. Items of expense that can be shown to vary with ton-miles, car-miles, or train-miles, for instance, may properly be distributed by cost accounting methods. Cost accounting performs a useful service in such cases. Then, it must be remembered that the rule of *Northern Pacific Railway Co. v. North Dakota*, discussed in preceding pages, gives apportionments of overhead expenses a significance in law which they do not have in economics. The rule makes rates impregnable against attack which may not be sound economically. In the third place, rates are frequently based on relative costs. In other words, differences in rates

5. "American Railroad Statistics," 1 American Statistical Association Publications (new series) 241, 249 (1889).

6. *Op. cit.*, p. 451.

7. "The Theory of Differential Rates," 30 Q. J. E. 682, 696 (1916).

8. "Public Utility Rate Regulation," 7 Har. Bus. Rev. 413, 419 (1929).

are often based upon differences in cost of service. This is often done in cases involving unjust discrimination or undue preference and advantage. In such cases, as Olmsted points out, the bases of apportionment are of comparatively small importance, if consistently used, as the apportionments cancel each other.⁹

IS THE ASSUMPTION OF UNUSED CAPACITY
ON RAILROADS VALID?

The argument for charging what the traffic will bear is based upon the assumption of unused capacity. One school of writers asserts that this assumption is not valid, and that rates should therefore be based on cost of service. This position was stated very briefly by Allyn A. Young in 1914. The justification of discriminating rates, he says, "assumes a static view of the facts; it postulates that a large part of our railway plant and equipment is a given quantum, more than ample for present transportation needs." He then goes on to show that when we take into account increasing population and wealth and transportation needs, we see that not only the cost of conducting transportation but maintenance costs and fixed charges too are increasing, and one item about as fast as another. "From the long-time, social, point of view, fixed charges are apt to be variable charges."¹

A similar view was presented by R. J. McFall in 1916. The law of increasing returns, he asserts, has lost its force as applied to the railroad business. "The business of our railroads is in a growing state," he says, "and in such a state of affairs, each increment of traffic contributes to the necessity for an increase of the joint expenses of the road. . . . The increase of business is continually causing greater joint movement expense, and is even necessitating the larger investment of capital. Since this is so, it does not seem to be absurd to claim that to each class of traffic corresponds a certain part

9. *Op. cit.*, p. 221.

1. "Railway Rate Making," 4 *American Economic Review* (supplement) 82, 84.

of not only the movement expenses, but the capital charges as well."²

A similar view was taken by Owen Ely in *Railway Rates and Cost of Service* (1924). He believed that the principle of increasing returns had ceased to operate on some of the largest railroads. He criticizes the assumption that additional traffic can be taken at reduced cost by saying: "To assume that a large part of the total cost is fixed, and will not vary with the amount of traffic, obviously fails to take into account railroad dynamics. As any railroad grows in size, its interest charges and its maintenance costs must increase."³

M. O. Lorenz⁴ and J. M. Clark⁵ have also cautioned against acting on the principle that added traffic means little extra cost when the railroads are finding it necessary to enlarge their plants on account of growing traffic. Both of these writers, however, recognize the validity of discriminating charges, but are of the opinion that the practice is overdone.

In considering the validity of this argument against discriminating charges, and in favor of the cost-of-service principle, it should be noted that, altho the justification of charging what the traffic will bear largely rests upon the assumption of unused capacity, it does not follow that discrimination will or should disappear as soon as unused capacity disappears. If all railroad rates were put upon a cost basis the condition of unused capacity would at once return. A considerable degree of differentiation is necessary to utilize existing plant. Even if a condition of unused capacity were a thing of the past on American railroads, which is decidedly contrary to the testimony of railroad representatives, classification of freight and other forms of differential charging would not disappear. The application of the cost-of-service principle would destroy much-needed traffic.

2. "Railway Monopoly and Rate Regulation," 69 *Studies in History, Economics and Public Law* 1, 192 (1916).

3. P. 69.

4. "Cost and Value of Service in Railroad Rate-Making," 30 *Q. J. E.* 205 (1916); and "Constant and Variable Railroad Expenditures and the Distance Tariff," 21 *Q. J. E.* 283 (1907).

5. *The Economics of Overhead Costs* (1923), pp. 104-105.

There is a second reason for believing that a pro-rata distribution of overhead costs would be unwise even if the railroads find it necessary to enlarge their facilities. The whole plant does not have to be expanded at once. There is always one or a number of factors limiting the capacity of the road. Strictly speaking, traffic will not be sought which does not cover the additional capital and other costs occasioned by the enlargement of the plant, but even so, this may be less than the full share of all overhead costs. The extra traffic occasions an extra capital cost, but still enables other portions of the plant to be utilized more nearly to capacity without additional expense. Furthermore, after the capital expenditure has been made in the enlargement of the plant, the capital becomes a "sunk cost" like the original investment in the road, and there may be differential charging for the purpose of fully utilizing it.

A third reason for continuing discriminating rates lies in the fact that a large plant may be more efficient than a smaller one. In other words, the principle of increasing returns may result either from the more complete utilization of plant, or from the greater efficiency of a large plant. Lorenz mentions this fact⁶ and it is also pointed out by Eliot Jones.⁷ To what extent there is economy from this source it is difficult to say. But in so far as there is an economy in the larger plant, a motive for discriminating rates continues.

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6. "Cost and Value of Service in Railroad Rate-Making," 30 Q. J. E. 205 (1916).

7. Principles of Railway Transportation (1924), p. 81.

THEORETICAL REMARKS ON PRICE POLICY HOTELLING'S CASE WITH VARIATIONS

SUMMARY

Introductory; two sets of conditions where price policy presents special problems, 231; already noted by various writers, 232.— Hotelling's case, 233.— The graphical solution of the problem, 233; and alternative algebraic method, 235.— Possible growth of monopoly, 242.— Price differentiation, 243.— Modifications of the case, different or varying transport costs, 245; varying costs of production, 245; the question of location, 248; elasticity in demand, 248.— Outside competition, 250.— Dynamic considerations in practice, 252.— Inadequacy of pure monopoly approach, 253.— Conclusion, 253.

Entrepreneur's price policy calls for an analysis different in important respects from the analysis of either free competition or pure monopoly. In the case of pure competition, in fact, a real price policy is impossible. For here conditions are such that price is determined by forces of supply and demand beyond the control of the individual producer. All that any enterpriser can do is adjust his output to the price already established. In pure monopoly, on the other hand, the single entrepreneur has an unfettered power to fix prices, either directly or through control of output, at a level to afford him the maximum gain. But even here the full implications of price policy do not show, because the case — which must be rare — is so simple.

Only in two sets of more complicated examples does the element appear in its full significance. One set is that of a single market supplied by a few large concerns each one of which is big enough to pursue an active price policy of its own. Under these conditions we find difficult and important problems of the interaction of the policies of the several firms, as well as some pertinence to the question as to whether there may be here a determinate equilibrium. The second set of examples arises from recognition of the fact that in actual business practice entrepreneurs are not as a rule placed in exactly the same market. There are various causes of differ-

ence between the positions of the entrepreneurs, which serve in some degree to divide the market among them. Differences in the quality of the product may retain for each a sort of special market; consumers' connection may do likewise; and geographical distance gives each producer an advantage in transportation cost within his own neighborhood. It is this second set of cases which the present paper will consider.

The two cases already have received some notice. The former set attracted the attention of Cournot¹ as early as 1838, and has challenged also more recent investigators, among them myself. The latter, too, has interested some theorists. Marshall has emphasized the "particular," "peculiar," and "special" market of the individual entrepreneur, and has dwelt upon his "particular demand curve" and his "fears of spoiling his own peculiar market." J. M. Clark, in his *Economics of Overhead Costs*, has attached great importance to the connection of customers with individual entrepreneurs, as also has Sraffa in his article on the Laws of Return under Competitive Conditions in the *Economic Journal*, 1926. Similarly, Harold Hotelling² has investigated the effects of geographical distance between producers in relation to the theoretical equilibrium of prices and sales.

It would be most valuable for others to supplement such theory with inductive study of these problems in fields where data are available. Material might be obtainable, for example, on the retail trade. But empirical investigation is bound to be difficult, and might turn out to be quite fruitless, on account of the confusing complexity of the factors operative. Thus, it might be utterly impossible to separate the effect of differences between the positions of entrepreneurs

1. *Recherches sur les Principes Mathématiques de la Théorie des Richesses*. Cournot's solution has been criticised by Bertrand, Edgeworth, Pareto and others. In recent years it has been defended by Wicksell and Schumpeter. Cf. my book *Problems of Monopoly and Economic Warfare*, Routledge, 1930, in which Cournot's solution is treated as a possible but very particular case.

2. *Stability in Competition*, *Economic Journal*, 1929. Cf. my article, *Between Monopoly and Competition*, *Nationalökonomisk Tidskrift*, 1929, and my above-mentioned book.

with respect to the market from that of the always-important individual and personal conditions. In any case theory must serve as a guide to such investigation. For only a person familiar with the method of calculation and reasoning which is likely to guide unconsciously the actions of business men in their search for maximum profit can hope to obtain any valid results from a realistic study of problems of this character.

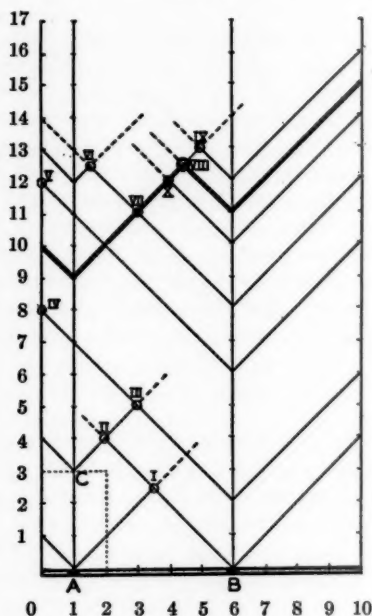
My object in the present paper is theoretical. I propose to offer a method of solution applicable to problems of the second set, that is, cases in which variations in the quality of product, consumers' connections, and geographical distance are of some significance in price policy. Hotelling, as previously stated, has already done some work in this connection. Specifically, he has found the conditions of equilibrium for certain simple cases in which two enterprises of given locations some distance apart try to get the maximum receipts. He has solved the problem by the use of differential calculus. I have worked out a graphical solution, also somewhat complicated, which seems equally successful. In what follows, first, I shall apply my construction to an example of the simplest kind, and proceed, next, to a study of some more elaborate variations.

Let us imagine an island or an isolated valley traversed by a single straight highroad, ten miles in length. In Figure 1 the road is represented by the double line at the bottom. A bakery is situated at the point *A*, one mile from one end of the road, and at *B*, four miles from the other end, stands a second bakery. The firms are assumed to produce at the same constant costs, and in the beginning to set prices which will just cover costs. Loaves are called for by the shops and direct customers of the district, so that there is no possibility of a price differentiation based on the distance of the individual consumers from the two producers. The cost of transportation is one cent per loaf for each mile. The total volume of sales is assumed to be independent of the price, for instance one carload per mile, but it is recognized that the distri-

bution of the sales between the two producers depends upon their prices.

What, under these circumstances, are the two bakers going to do? Can they, without any agreement, express or tacit, take measures to obtain a profit above costs?

FIG. 1



So long as neither of them raises his price, A's price in excess of costs is zero, his sales are three and one-half carloads, namely, one carload to the one-mile special market behind him, in the figure to the left of A, and two and one-half carloads to his part of the five miles between A and B. B's condition is similar. Neither producer receives any excess profit. All of which may be written as follows:

Situation I.

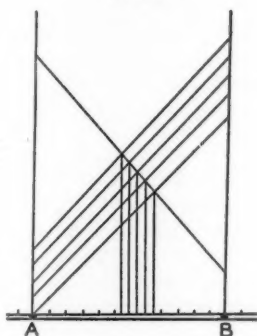
A price (in excess of costs) = 0; sales = $1 + 2\frac{1}{2} = 3\frac{1}{2}$; profit = $0.3\frac{1}{2} = 0$.

Similarly in the case of *B*:

B excess price = 0; sales $4 + 2\frac{1}{2} = 6\frac{1}{2}$; profit $0.6\frac{1}{2} = 0$.

If along the vertical lines rising from the points *A* and *B* we plot the price in excess of costs charged by each of the two entrepreneurs under different conditions, we can indicate the local prices, or rather the local prices in excess of costs, to consumers in the different parts of the market, by points located on gradients sloping evenly in either direction from the points indicating the prices at the bakeries of *A* and *B*. In the assumed situation, where no price is charged in excess of costs, the gradients begin at *A* and *B*. They intersect at point *I*. The portion of the market between the two pro-

FIG. 2



ducers is shared equally by them because the costs of transportation are the same in both directions. The highest local price is obtained in the remotest part of *B*'s special market (on the extreme right of the figure).

Now, let us assume that *A*, for instance, is cautiously trying to obtain a profit by charging a price in excess of costs, say by three cents. What is the result? His area of sales is

then limited to one mile behind him (to the left of *A*) plus one mile between *A* and *B*, or two miles in all, and his profits are $3.2 = 6$. That the area of sales of *A* is in this case reduced from two and one-half miles to one mile of the interjacent market, is easily seen from Figure 2, which shows that the one entrepreneur loses one-half mile of his market to the other for each cent by which he raises his price above that of his rival. Hence we have:

Situation II.

A excess price = 3; sales = $1 + 1 = 2$; profit = $3.2 = 6$

B excess price = 0; sales = $4 + 4 = 8$; profit = $0.8 = 0$

Situation II has been illustrated in Figure 1 by the intersection of the gradients from a point *C*, three units (cents) above *A*, and from *B*, whose excess price is zero. *A*'s profit is represented by the rectangle between the two dotted lines and the outer lines of the figure. If, for instance, we assume the common costs of production to be forty cents, the costs of transportation and excess prices seen in the figure will be comparatively small.³

Now *B* will also try very cautiously to obtain a profit by setting a price in excess of his costs. We have, for example:

Situation III.

A excess price = 3; sales = $1 + 2 = 3$; profit = $3.3 = 9$

B excess price = 2; sales = $4 + 3 = 7$; profit = $2.7 = 14$

Obviously, there is a possibility of profit by raising the price; and, since we have assumed the total demand to be independent of the price, there seems to be an encouragement to proceed very far. We might have then:

Situation IV.

A excess price = 12; sales = $0 + 0 = 0$; profit = $12.0 = 0$

B excess price = 2; sales = $4 + 6 = 10$; profit = $2.10 = 20$

But the difference between the prices of *A* and *B* here has

3. The author's arithmetic examples seem to neglect that the demand for product is one carload per mile, and not one loaf of bread. To correct for this oversight would obviously alter the figures. But since no question of principle is involved the figures are being left unchanged.
—Editor.

become so great that it is possible for *B* to capture the whole market, including the part of the road behind *A*. So the question arises, how far is *B* able to raise his price and still retain the whole of the market, when we consider only differences in price of at least one cent? This is seen from:

Situation V.

A excess price = 12; sales = $0+0=0$; profit = $12.0=0$

B excess price = 6; sales = $4+6=10$; profit = $6.10=60$

The difference must be greater than the costs of transportation from *B* to *A*, in order for *B* to retain the part of the market behind *A*. But will it not be to the advantage of *B* to set a higher price even tho by doing so he will have to give up part of the market to *A*? This supposition is confirmed by:

Situation VI.

A excess price = 12; sales = $1+1\frac{1}{2}=1\frac{1}{2}$; profit = $12.1\frac{1}{2}=18$

B excess price = 8; sales = $4+4\frac{1}{2}=8\frac{1}{2}$; profit = $8.8\frac{1}{2}=68$

From situations IV and V, *A* has learned that it is unprofitable for him to set a price which is too high as compared with *B*'s. Furthermore, he has learned that he may expect *B* to raise his price, whereby his own (*A*'s) sales will be increased.

So far no equilibrium has been reached. As soon as one party makes a change, the other party tries to adjust his policy accordingly. But this very adjustment upsets the former position in such a way that the first party is now interested in further change. Does there exist any situation in which both parties are simultaneously in a position of equilibrium, from which it is not to the interest of either party to depart? If so, we may imagine them to approach this stage by a gradual process of adjustment. Further, the above-mentioned situations seem to indicate a tendency towards certain intermediate prices. Suppose that by guesswork or calculation *A* stops at the price nine, which, as we shall find later by theoretical calculation, is actually his final point of equilibrium. Before *B* has had time to adjust his price hereto, we obtain:

Situation VII.

A excess price = 9; sales = $1+2=3$; profit $9 \cdot 3 = 27$

B excess price = 8; sales = $4+3=7$; profit $8 \cdot 7 = 56$

A, however, has guessed or calculated in advance that when *B* has had time to find out by calculation or by experience which position would give him the maximum profit, he would raise his price. This state of affairs is illustrated in:

Situation VIII (Equilibrium).

A excess price = 9; sales = $1+3\frac{1}{2}=4\frac{1}{2}$;
profit = $9 \cdot 4\frac{1}{2} = 40\frac{1}{2}$

B excess price = 11; sales = $4+1\frac{1}{2}=5\frac{1}{2}$;
profit = $11 \cdot 5\frac{1}{2} = 60\frac{1}{2}$

That *B* has actually reached here a kind of equilibrium, is seen by a comparison with the two following situations, from which it appears that *B* reduces his profit by raising his price as well as by lowering it:

Situation IX.

A excess price = 9; sales = $1+4=5$; profit = $9 \cdot 5 = 45$

B excess price = 12; sales = $4+1=5$; profit = $12 \cdot 5 = 60$

Situation X.

A excess price = 9; sales = $1+3=4$; profit = $4 \cdot 9 = 36$

B excess price = 10; sales = $4+2=6$; profit = $6 \cdot 10 = 60$

In the same way a reduction or an increase of *A*'s price will reduce his profit. Near the theoretical point of equilibrium the difference in profit is only small; and in real life an approximate adjustment within a certain zone will be deemed satisfactory. Consequently in this zone influences other than the effort to obtain a maximum profit will have a relatively free scope; but the divergence from the exact theoretical point of equilibrium, as defined by maximum profit, will not be greater than that just allowed by the strength of the other influences.

Accordingly, with the assumed policy of the two entrepreneurs, we seem to have reached a position of equilibrium at which *A* sets a price of 9 and *B* one of 11. That *B* obtains the higher price is due to the fact that he has the greater

sheltered market behind him and therefore need not pay so much attention to the fact that the higher price reduces his share of the interjacent market.

The theoretic proof of the existence of one equilibrium and the determination of its position has been given by Hotelling, as mentioned above, by the application of differential calculus. We see now that it can also be done graphically. There is, however, still a third method of solution, which involves only simple equations, to which we may proceed.

Let p_a and p_b be the prices charged by the two entrepreneurs in excess of the assumed equal and constant costs, q_a and q_b indicate their sales. Here, too, let us assume the markets behind A and B to be one and four carloads respectively, and the interjacent market five carloads. (The figures 1, 4 and 5 can, of course, without any difficulty be replaced by others or by letters.)

(1) The whole of the market is divided by the parties, thus:

$$q_a + q_b = 10 \quad (1)$$

(2) The price to consumers of the products of the two entrepreneurs, including the costs of transportation, must be the same at that point on the road where their markets meet. This is the case $q_a - 1$ miles to the right of A and $q_b - 4$ miles to the left of B , the costs of transportation in cents being equal to the indicated distances in miles, that is:

$$p_a + (q_a - 1) = p_b + (q_b - 4) \quad (2)$$

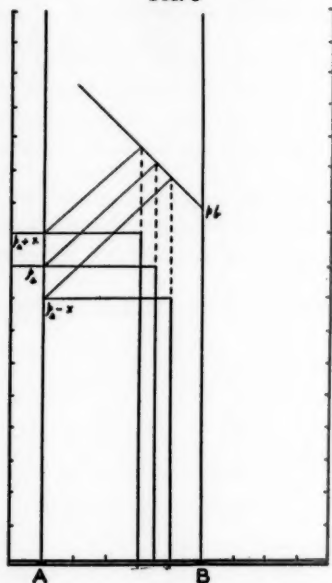
(3) and (4). Finally, under the assumed conditions there is an inverse relationship between the excess price set by each entrepreneur and his corresponding sales. For each price set by B it is possible to find the price that gives A a maximum profit; so that when B 's price is considered also variable, we can find a general condition for equilibrium between A 's price and sales. If B sets an excess price of p_b (cf. Figure 3), the local prices to consumers in the part of the market supplied by B , and consequently also the price at the point of division between A 's and B 's markets, are to be found on the gradient to the left from p_b . A 's price must

then be set in such a way that $p_a \cdot q_a$ yields a maximum. This is obtained when:

$$q_a = \frac{1}{2}p_a \quad (3)$$

An increase or reduction of the price will react on the sales with half the force and in the opposite direction (cf. the

FIG. 3



remarks above on Figure 2). It is also seen from Figure 3 that when $q_a = \frac{1}{2}p_a$, the maximum of $q_a \cdot p_a$ is reached, since:

$$(p_a + x) \cdot \frac{1}{2}(p_a - x) < p_a \cdot \frac{1}{2}p_a > (p_a - x) \cdot \frac{1}{2}(p_a + x).$$

Similarly, we have:

$$q_b = \frac{1}{2}p_b \quad (4)$$

From these equations we obtain precisely the same solution as that which we had reached in situation VIII.

From equations (3) and (4) we also obtain $p_a + p_b = 2(q_a + q_b)$, which means that the sum of the two prices is

equal to twice the costs of transportation through the whole area. If one of the parties has so large a market behind him that he surrenders the whole of the interjacent market to his rival, we shall have, instead of the formulae 1-4, a given quantity of sales for either party and a given difference between their prices; in this case, furthermore, the price charged by the higher price producer is to be found at the exact point at which he is unable to increase his profit by capturing the whole of the market. If, for instance, the distance from one end of the road to *A*'s factory is six miles, the distance from there to *B*'s factory three miles, and the latter is situated one mile from the other end of the road, we obtain $q_a=6$; $q_b=3+1=4$; $p_a=p_b+3$ and $6 \cdot p_a=10(p_b-3)$, i.e., $p_a=15$ and $p_b=12$. If the length of the whole road is r , the part to the left of *A* a , and that to the right of *B* b , one party (*A*) will capture the whole of the interjacent market if $a \geq (3r-b) : 5$.

The next question to be considered is: would the entrepreneurs, even if seeking their maximum profit, behave in the way we have assumed, or would they find it more advantageous to react in quite a different way?

We have assumed that the parties did not come to any agreement with one another nor reckon with any reciprocal services, but that at each point and at each moment they aimed only at their immediate profit. This means, for one thing, that consideration of the other party did not prevent either one of them from adjusting his sales to the given price. Nor did either of them open a cut-throat competition in order to improve his future position. Each of them set his price in answer to that of the other so as to obtain an immediate maximum profit. Thus a situation of equilibrium was reached in which neither producer found it advantageous to change the price. Since, however, the example assumes a demand quite inelastic, it is obvious that both producers are really able to raise their profits by a considerable simultaneous increase of their prices. They will probably do so, even tho at these high prices there exists no combination of prices which will lead to a situation where both may still be

not interested in further alterations. Generally, each will charge higher prices if, on the basis of an express or tacit understanding, he believes that the other party will not go on manipulating price or sales to his detriment. Conceivably one of the entrepreneurs may also be willing to sustain the loss inflicted on him by the non-coöperating manoeuvres of the other party.

The transition from the previously described semi-monopolistic state to a joint monopoly policy depends on the institutional and psychological basis for coöperation. Experience seems to indicate that the necessary basis exists in a great number of cases, but by no means in all. In actual business, therefore, both types of price policy occur. Competition from the outside, or a fear that public interference will limit the absolutely monopolistic character of the price policy, may also persuade entrepreneurs to be contented with a semi-monopolistic policy. An absolutely monopolistic policy may, however, be adopted temporarily in periods when a low price level would otherwise tempt entrepreneurs to carry on destructive competition. Cartels which are not strong enough to exercise an effective control over their members, will probably be far better able to apply the smaller increase in the price, because in that way the members obtain an equilibrium between price and their individual possibilities of expansion, and thus feel no temptation to increase their sales by means of rebates and favoritism. The effect of coöperation here is to abolish cut-throat competition, i.e., the cartel secures a continued and stabilized co-existence on a favorable market. Probably, the price is often set between the two points of equilibrium described above, as the underlying institutional and psychological conditions range between the pure types.

If in reality, the absolute or limited monopoly policy is applied in all cases where there are differences in transport cost, consumers' connections and variations in quality between the sellers, what becomes of all the profit that is obtained above costs? Through capitalization, transformation into rent, and possibly through a rise in the level of

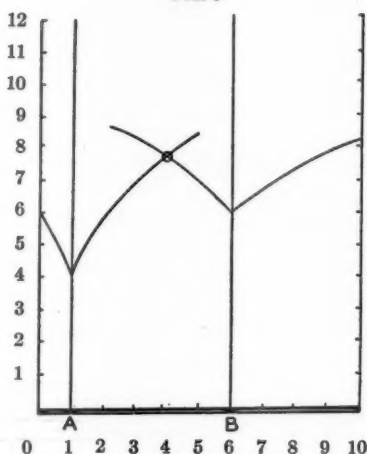
income for certain classes of entrepreneurs and trades, the profit in excess of an imaginary free-competition level will easily make itself invisible. Generally, a monopolistic or semi-monopolistic policy, by diminishing the volume of production, tends to reduce the demand for productive factors and, consequently, their price. But quite the opposite may be the result where the advantage of being placed at some distance from one's rivals, as for instance in the retail trade, leads to an increased influx of productive factors.

Coöperation implies agreement between two parties, and as the fixing of a price above the point corresponding to the semi-monopolistic equilibrium requires a certain amount of self-control on the part of at least one of the parties, for instance with regard to rebates, there may be some difficulty in increasing profits by this method. But are there no other methods of doing so? Obviously there are for each firm, such as an absolutely monopolistic seizure of the market by purchase of the competing enterprise, or stoppage and suppression by drastic competition. Here dynamic factors enter into the problem, especially when the case is not, as we have hitherto assumed, one of constant and uniform costs, but one in which increasing return and technical development play a role.

Another means of increasing profits is price differentiation within the market. This may be applied by the two bakeries in our example if they themselves undertake or control the distribution. If, as in the main example above, we assume that one enterprise does not consider the interests of the other, it may, in order to obtain an advantage, prefer to sell in any part of the market without any profit rather than suffer the rival to get in. This means that *A* in Figure 4 is in no place able to obtain any price above the line *BD*, which rises with the costs of transportation from *B*, and producer *B* not above the line *AC*. This necessarily involves that the interjacent market be divided equally, and that the local price in excess of costs at the mid point (where the parties meet) is equal to the costs of transportation from *A* and *B*,

What will be the result if the cost of transportation is not the same for *A* and *B*, or if the costs do not increase in proportion to distance? The solution is illustrated in Figure 5. The lines from *A* and *B* will then have a different gradient, or they may curve, probably with a decreasing ascent.

FIG. 5



What will be the result if we abandon the assumption of constant and equal costs of production for the two enterprises? The local prices paid by the consumers will, just as in Figure 5, increase regularly with the distance from the places of production multiplied by the cost of transportation per mile; but this figure no longer illustrates the price in excess of costs, which again determines the price policy. The importance of special markets has been given by some writers⁴ as an explanation why individual enterprises cease to expand in fields where large-scale production continues to bring a decrease in costs. It has been argued that increased costs of transportation, marketing, and so forth, after a certain point,

4. Sraffa, for example, in the article previously referred to.

$\frac{1}{2}$ cent. In the figure, which in other respects corresponds to Figure 1, c_a indicates A 's constant costs, and c_b B 's decreasing average costs when his production is extended beyond his special market. c_b' , consequently, is the actual average cost in the present case where the markets of A and B meet at G . In the following equations, which correspond to the equations mentioned on page 00, p_a and p_b indicate the price in excess of 40.

$$\begin{aligned}
 (1) \quad & q_a + q_b = 10 \\
 (2) \quad & p_a + q_a - 1 = p_b + q_b - 4 \\
 (3) \quad & (p_a - 3) = 2q_a \\
 (4) \quad & (p_b + (q_b - 4)\frac{1}{2}) = \frac{3}{2} q_b
 \end{aligned}$$

The quantities on the left side of the equations (3) and (4) indicate the prices in excess of costs. In the last equation the factor 2 of the corresponding equation on page 00 has been replaced by $\frac{3}{2}$. When A keeps the price P , and his local prices thus correspond to the line PE , the price obtained by B when his sales and local prices are at F , G and H , will be F' , G' and H' , where the lines $F'F$, $G'G$ and $H'H$ indicate the costs of transportation reduced by the fall in the average costs of production. Consequently, when the sales are reduced by 1, the corresponding excess price increases by $\frac{3}{2}$, and so the maximum profit is obtained when sales are $\frac{3}{2}$ multiplied by the excess price, cf. Figures 2 and 3, where the steeper gradient of the lines from B gives a higher proportional between optimum price and optimum sales. As also appears from the figure, we obtain the following solution of the equations: $p_a = 9\frac{2}{5}$, $p_b = 8\frac{4}{5}$, $q_a = 3\frac{1}{5}$ and $q_b = 6\frac{4}{5}$. The excess price is, in the case of A , $6\frac{2}{5}$, and of B , $10\frac{1}{5}$, as compared with 9 and 11 in Figure 1, where sales were $4\frac{1}{2}$ and $5\frac{1}{2}$ and the costs of both were 40. B 's increased share in the sales is due to lower costs. That his excess price, nevertheless, is a little lower, is due to the fact that decreasing costs make him prefer expansion to an increase of the price. A 's excess price is reduced mainly as a consequence of his relatively high costs.

When increasing production entails not lower but higher costs, the increase in the costs of production has the same effect as the costs of transportation.

We now return to the assumptions of constant and equal costs of production and transportation for the two enterprises, in order to introduce modifications in other directions. Suppose the buildings of *B* were burnt down. Suppose, also, that there is danger neither of a third competitor entering the field nor of *A* opening a cut-throat competition. If then *B* has perfectly free choice in the matter, where will it be most advantageous for him to rebuild?

The best location is as close as possible to *A*, so that *B* himself gets the greatest possible market behind him. Hotelling has proved this in the above-mentioned article, and the same thing can be proved by our method. Thus, when *B* moves to a place one mile to the right of *A*, his profit, according to the semi-monopolistic assumptions, will be 80 as against formerly $60\frac{1}{2}$, and that of *A*, 18 as against formerly $40\frac{1}{2}$.⁵ It should be added, however, as Hotelling points out, that when the assumption of an absolutely inelastic demand is abandoned, the most advantageous location turns out to be at a certain distance from the rival enterprise.

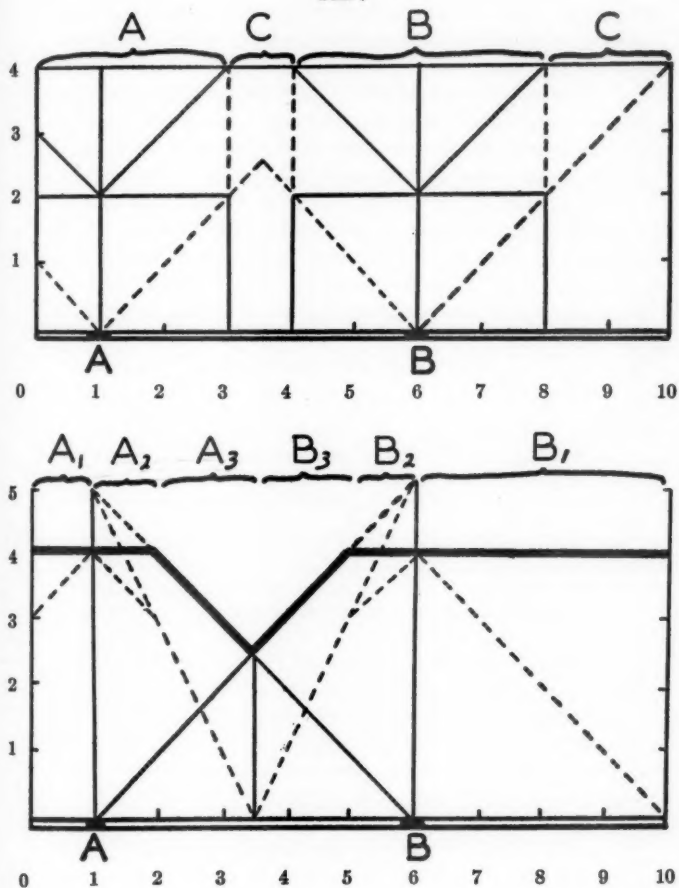
What will be the result if we quite eliminate the distance between the parties and place them together, either in the middle or in any other place of the market? In that case, if we assume demand to be absolutely inelastic, a determinate solution can scarcely be found. But if we assume some elasticity to demand, a definite solution is obtained at a price in excess of costs somewhat lower than in the case of absolute monopoly. This solution, indicated by Cournot, must be modified according to the capacity of individual sellers to expand sales by acquiring new customers or by capturing customers from their rival (cf. Chapter II of my above-mentioned book).

Another variation of the problem is suggested by the fact

5. $q_a = 2$; $q_b = 8$; $p_b = p_a + 1$; $p_b \cdot 8 = (p_b - 2)10$, cf. page xx; from this we obtain $p_a = 9$ and $p_b = 10$.

that in real life markets rarely have the form of a straight line with equal sales at each point, but spread more or less regularly over a plane, with more or less distinct lines of division between the markets. This brings us to the question of

FIG. 7



Standort and price policy. As a highly simplified approximation we shall examine a case in which competition from without puts an absolute limit to the prices of the two undertakings.

Let us assume, for instance, that the buyers will start baking their own bread if price, including costs of transportation, rises more than four cents above actual costs of production. This limit will be of no importance, of course, if the bakers do not set price in excess of costs, for then local prices will be only one cent above costs of production in the market behind *A*, two and one-half cents above costs between *A* and *B* and exactly four cents over costs at the extreme limit of *B*'s special market (cf. the dotted lines from *A* and *B* in Figure 7, I, and the horizontal line at four cents). But if the two entrepreneurs try to obtain the greatest possible profit, they must, unless they use price differentiation, set their prices so high that they are unable to sell in all parts of the market. Thus, if we consider each entrepreneur separately, as if he were alone in the market, we have the following possibilities:

A can

- set an excess price of 1 c., sell $1+3=4$ carloads, and earn $1.4=4$
- set an excess price of 2 c., sell $1+2=3$ carloads, and earn $3.2=6$
- set an excess price of 3 c., sell $1+1=2$ carloads, and earn $3.2=6$
- set an excess price of 4 c., sell $0+0=0$ carloads, and earn $4.0=0$

B can

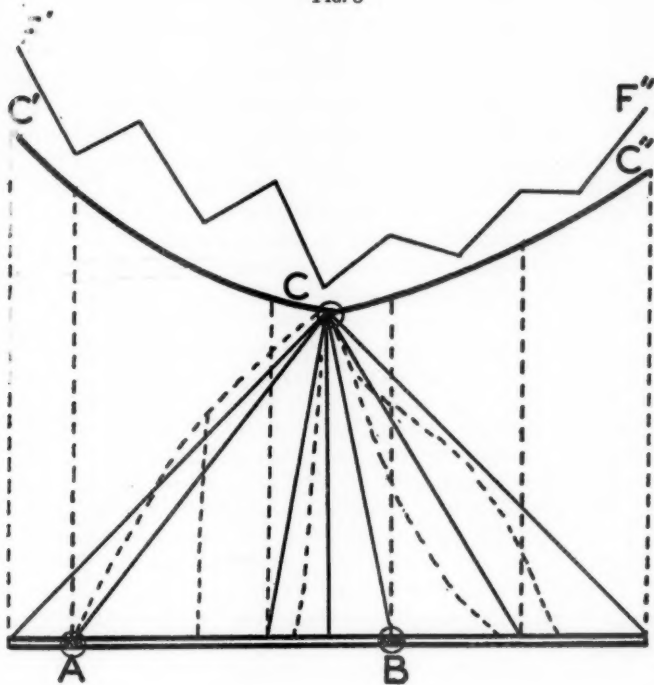
- set an excess price of 1 c., sell $3+3=6$ carloads, and earn $1.6=6$
- set an excess price of 2 c., sell $2+2=4$ carloads, and earn $2.4=8$
- set an excess price of 3 c., sell $1+1=2$ carloads, and earn $3.2=6$
- set an excess price of 4 c., sell $0+0=0$ carloads, and earn $4.0=0$

If, however, they simultaneously set an excess price of one cent, necessarily sales will be reduced. *A* will choose either two or three cents and *B* two cents, the result of which is that part of the market between *A* and *B* as well as part of the market behind *B* will not be supplied by the two producers (cf. Figure 7, I, where both have chosen the price of two cents). The figure indicates which parts of the market are supplied by *A* and *B*, and which not (labelled *C*). Our example has been chosen to illustrate the effects of external sources of

competition, but it illustrates also the effects — obviously similar — of a demand which is elastic in its upper reaches.

If the two undertakings are able to differentiate prices, as they are strongly tempted to do, they will retain the whole market. This is illustrated in Figure 7, II. The local prices follow the heavy solid line at the top of the figure, while the excess price in the different localities corresponds to the heavy dotted line. In the zones A_1 and A_2 as well as in B_1 and B_2 the internal competition has been superseded by competition from without, while in those parts of the competitive zone where the local prices are lower than the maximum price as

FIG. 8



determined from without (A_1 and B_1) the conditions are quite as in Figure 4.

Competition from without often asserts itself with very different strength in different parts of the market. The simplest case (Figure 8) is the existence of a third competitor located at a certain distance from the road between A and B . Let us assume as a starting point that there is a town with a great number of competing undertakings. At each point in the markets of A and B we then have maximum limits to the price corresponding to the height of the parabolic curve $C'CC''$. The height of the curve above any point on the line AB corresponds to the distance of the point from C , and at the same time it indicates the possible local price in excess of C 's price. Since in reality roads are limited in number and are of varying qualities, the curve should, to be strictly accurate, be more of an irregular form, like the zig-zag line $F'F''$. But this correction introduces no alteration of principle.

If, now, C is also an individual undertaking conducting an active price policy, conditions are more complicated. In this case each entrepreneur still tries to hold and exploit the part of the market easiest of access to him, and at the same time endeavors to make this part as large as possible.

The problem is still further complicated when we consider, not a market of the form of an evenly populated highroad and of absolutely inelastic demand, but the market of the irregularly populated and travelled surface of the globe, with demands of varying elasticity, and with competition involving a great number of qualities. Price policy then becomes not a simple mathematical puzzle, but an art. Moreover, for the living business firm, the final question is not one of finding favorable static equilibrium, but of planning and carrying through as sound a development as possible by means of technical alterations, advertising and service, coöperation and rivalry in many forms with neighboring concerns. Consequently, the equilibrium is not stationary, but dynamic, and a price policy adapted to realities must consider the possibilities of the future as well as the present, and must constantly adapt itself to ever changing conditions.

The individual entrepreneur who is in any respect distinct from his competitors can always be considered for theoretical purposes a monopolist. And his special demand, depending on surrounding conditions, may be represented in varying degrees of elasticity. We might have studied our cases from this angle but for one great difficulty. In our examples the demand is not a fixed and solid relation or series of relations between price and quantity, but a thing that varies according as rival entrepreneurs react to the price policy of the would-be monopolist. Thus, there arises an interaction, which is partly "fair" competition, partly coöperation, and partly fighting measures. And this interaction spreads through many links along that chain of small markets which is called the world market, but which in reality is only one market with one price in those rare cases where distances and differences are of negligible importance.

Technical, geographic and personal conditions have created productive units of certain sizes and types, which are not easily changed, and the productive forces do not flow between these according to any law of combined vessels. The economic process, therefore, does not take place in large uniform markets, but by a multifarious interaction between concrete productive units, now by substantially free competition, now by a partly monopolistic price policy, sometimes by combination and occasionally by warfare.

The extent to which conditions in the individual spheres are ruled by competition and price equalization depends, among other things, upon the influence which geographic and qualitative differences have upon prices. The observation of facts, therefore, must decide whether the cases we have examined in this paper are but faint ripples on an otherwise smooth surface, or whether they are of universal and fundamental significance.

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THE LOCATION OF THE SHOE INDUSTRY IN THE UNITED STATES¹

SUMMARY

The theory of industrial location, 254.— Preliminary deductions in the case of the shoe industry, 255.— History of the distribution of the industry. Period 1630-1760: non-localized hand work, 257.— Period 1760-1860: localization of the hand industry, relation of railroads to factors of transportation and labor cost, 259.— Period 1860-1900: effect of mechanization, shifts in the tanning industry, changes in financing; equalization of regional advantages, 264.— Period since 1900: rapid style changes, foreign markets, labor organization, 269.— Outlook for the future, 273.— The theory in the light of experience in the shoe industry, 274.

THE formulation of Alfred Weber's theory of the location of industries and its subsequent elaboration at the hands of other economists² have given a much-needed impetus to the investigation of concrete locational phenomena. For now that a theoretical structure, however imperfect, has been supplied, the student of a particular industry finds it possible to fit his results to the generalizations already arrived at, and perhaps to qualify those generalizations for their own good.

The theory of location is almost completely a German product, and it is not surprising that out of Germany have come most of the monographs interpreting the locational

1. In this article are summed up the conclusions of a thesis presented for the doctorate at Harvard University in 1932. I am particularly grateful for aid given by Professor E. F. Gay, under whose direction the thesis was written, and by Mrs. George W. (Blanche Hazard) Sprague of Brockton. Acknowledgement is due also to the officials of the Regal, Keith and Douglas firms, and to Professors Derwent Whitlesey and Edward S. Mason and Mr. H. S. Kemp of Harvard University.

2. An excellent presentation of Weber's theory and of subsequent developments is given by Hans Ritschl in "Reine und historische Dynamik des Standortes der Erzeugungszweige," in *Schmoller's Jahrbuch*, 1927, pp. 813-870. See also W. Krzyzanowski, "Review of the Literature of the Location of Industries," in the *Journal of Political Economy*, April, 1927.

histories of particular industries. Under Alfred Weber's personal direction eight of his students have written such monographs dealing with important German branches of production³; and Andreas Predöhl, the most important contributor to the subject after Weber, has investigated with significant results the geographical distribution of the cotton textile, paper, and iron and steel industries of the United States.⁴

Weber's theory shows to best advantage in the case of those industries where the chief locating factors are expressible in terms of transport costs: that is, in which location is determined with chief reference to proximity of markets or sources of materials or power or of some combination of these.⁵ The fact that transportation costs are only very roughly proportional to distance in a country where there are competing forms of transport, different classes of rates, and a non-mileage rate structure, of course, makes even such cases as these far from simple; but the difficulties involved are as nothing compared with those presented by industries whose distribution is determined with reference, say, to availability of cheap or specially trained labor, to acquired reputation of particular producing centers, or, as in all too many cases, to what we can as yet only call chance.

The shoe industry belongs in the category of those in which location is not completely explained by the Weberian theory. There is a large residue of "chance" factors remaining after exhaustion of all available clues; given the measurable preëxisting advantages of different locations, and with the theory as at present developed, no one could reconstruct in any detail the actual distribution of shoe manufacturing.

3. These have appeared as Hefte 1-8 of Weber's *Ueber den Standort der Industrien*, Teil II.

4. Three articles in *Weltwirtschaftliches Archiv*, entitled: "Die Südwanderung der amerikanischen Baumwollindustrie" (1929, pp. 106-159), "Die Wanderungen der amerikanisch-kanadischen Papierindustrie" (1929, pp. 285-330), and "Die örtliche Verteilung der amerikanischen Eisen- und Stahlindustrie" (1928, pp. 239-292).

5. Examples would be the manufacture of iron and steel, flour, paper, furniture, and cement.

For this reason the shoe industry furnishes a significant illustration of the way in which locational theory may be applied in practice, and of the limitations of the application. Its history should show us where the present theoretical apparatus is strong and, still more important, where it is weak and needs attention.

Starting first with such basic facts as the relative quantities of materials, power, and labor that go into the making of shoes, we are enabled by Weber's formulation to reach certain conclusions about the way in which the shoe industry is likely to behave with respect to location. This is not the proper place for an exposition of the methods employed and the theory behind them, which is ably summarized in an article by Dr. Andreas Predöhl.⁶ I shall spare the reader by presenting here only the conclusions, as follows:

I. The cost of transportation of the finished product, shoes, is more important than that of transportation of materials, partly because of the relation of the actual quantities involved and partly because shoes are more expensive to transport per unit of weight than are any of the important raw materials. On account of this higher cost of transporting the finished product, the location of the market will have a greater influence on the distribution of factories than will the location of supplies of materials.⁷

II. Due to the importance of labor costs in shoe manufacture, the industry will tend to be attracted to places with low labor costs even when these are far from materials or market.⁸

6. "The Theory of Location and General Economics," in the *Journal of Political Economy*, June, 1928; see particularly pp. 374-379.

7. In a detailed investigation undertaken by the writer, it was estimated that the relative importance of nearness to markets, leather supply, and fuel supply was in 1927, on this theoretical basis, 6+, 4, and 2-.

8. On the basis of present conditions it may be estimated that a place offering the inducement of a 10 per cent saving in labor costs would theoretically justify the locating of a plant as far as one thousand miles from the point of cheapest access to materials, fuel, and markets. Such computations as are referred to in this and the preceding footnote are obviously without claim to any quantitative accuracy; but I believe they are sufficient to show that the two most important deducible

III. The cheapening of transportation, of course, tends to lessen the influence upon location exerted by the factors involving transport costs (*i.e.*, distance from materials, fuel or power, and markets), and therefore to increase the attracting power of locations with low labor costs. But the evolution from the hand to the factory industry, with labor-saving machinery, has the contrary effect: that of decreasing the proportion of wages to total costs and therefore of reducing the locational importance of places where labor is cheap. Historically, we have both the cheapening of transportation and the mechanization of processes, and only historical investigation can show which has been the more important at each period.

IV. It can be deduced, from the fact that even yet shoemaking labor is of a fairly high level of skill, that the importance of industrial training would make especially attractive as locations for shoe factories those cities or districts where the industry for any reason became early established. A tendency to cluster is, then, to be expected.

V. The fact that shoes are an article of dress, which must not only fit the individual but be fashionable, would be likely to reinforce the importance of the factor of easy access to the chief markets.

It appears to the present writer that the history of the shoe industry can be divided into four periods, in each of which a different set of locating influences was dominant. It is impossible, of course, to fix exact dates for the beginning and end of these periods, and the chronological mileposts which I shall set up must be regarded as nothing more than convenient approximations.

First period (1630-1760). In this period, which we might call that of non-localized hand shoemaking, each village and neighborhood community produced its own supply of shoes, using local materials.⁹ In such circumstances there was

factors of location for the shoe industry are labor costs and nearness to the market, and that of these the former is the more important.

9. In the early part of this period, and in remoter regions, this was even true of the individual *household*.

obviously no question of alternative location of industry involved. The manufacture of shoes was distributed in the same pattern as population.

Almost from the beginning there was in the towns an elementary division of labor. Local craftsmen, first itinerant and later settled in their own shops, made shoes for the rest of the community. The knack of shoemaking soon ceased to be common property in the more settled regions.

In this handicraft organization there was, however, no change in the location of the industry with respect to population. Each pair of shoes had to be made to measure, which meant that the dominant factor of location was the market. Shoemakers sought their customers. Since leather was still produced practically everywhere, almost no transportation of either materials or products was involved in the making of shoes.

We see very early the beginnings of the next stage, that of localization of the hand industry. In certain districts along the Atlantic seaboard, principally eastern Massachusetts and around Philadelphia and New York City, population soon exceeded the limits of agricultural saturation. Commercial advantages, and in New England the poverty of the soil and the difficulty of gradual migration westward by land, accounted for the fact that for the populations of these districts, and especially of eastern Massachusetts, agriculture was of less relative importance than anywhere else on the coast or in the interior. There was a concentration of population in the coast towns, which were engaged in trading, shipping, fishing, and shipbuilding, and also in the tributary farming territory. This meant a concentrated market, a condition favorable for the development of manufacturing industry. The shipping services which these shore districts possessed were, in those days before the railroads, of great potential advantage in getting an adequate supply of materials and in reaching remote markets as soon as industry became more than a local affair.

Division of labor in any line of manufacture, as determined by the extent of the market, obviously had freer rein in

eastern Massachusetts and the New York-New Jersey-Philadelphia district than anywhere else in the country. The access to a large and concentrated market was more fundamental than advantages in labor supply which could be utilized only because the size of the market made advanced division of labor possible and profitable.

Second period (1760-1860). The initial specialization, consisting in the setting-up of the individual handicraftsman in the place of family manufacture, was first realized in the three districts we have named; and so likewise was the next stage, which consisted in the division of the process of shoemaking into operations, with workmen specializing in one or more of these parts of the trade.

It is easier to learn to make part of a shoe than a whole shoe, and accordingly this division of labor permitted either a lowering of the standards of labor skill or a raising of the standards of workmanship. Both took place. A differentiation arose between the making of good shoes, better than ever before, for individual measure, and the making of cheaper shoes for stock. The two branches of the industry thus separated pursued divergent paths. The custom manufacture followed the old lines, and its geographical distribution continued to be determined by the location of the markets. The making of shoes to individual order, relatively insignificant in amount, is distributed even today much as population is, except for an apparent tendency toward concentration in the largest cities.

In this custom industry there has never been much advance in technique or organization because the market is so restricted and scattered. Each pair being made to individual measure, there are no two alike, and no great amount of standardization is possible. The division of labor has accordingly proceeded only a little way. Machines are used scarcely at all, and the modern custom shoemaking establishment is very like the ones of a century ago. The clientele is practically limited to dancers, acrobats, and persons with oddly-shaped feet.

Since the location of the custom branch of the industry is

so simply determined, and also since the importance of this branch has shrunk to insignificance, let us give it no further consideration, but turn to the more complex question of the location of the other and now predominant branch of the industry which makes for wholesale order or for stock.

Once the policy of manufacture beyond individual order work had been adopted, there was no reason why shoemakers in one place could not send their product to other towns and other districts to be sold. Shoes had become an article of trade. The division of labor induced by the concentration of local market lent itself to the serving of a more extensive market and was thus itself encouraged.

I have placed the beginning of the second or localized-hand-industry period at 1760 because it was at about that time that both the eastern Massachusetts and the New York-Philadelphia districts began selling shoes elsewhere.

All of the original districts on account of their concentrated population, and Massachusetts in particular on account of the limitations of her agricultural possibilities, had a labor supply suited to the new form of organization in the shoe industry. Since machines were as yet unknown, there was no need to concentrate all the operations in a single place. The parts of shoes are light and easily carried about. Consequently we find that home workers by the thousands, in eastern Massachusetts and the three other states, were putting in their spare time in sewing uppers or performing other parts of the work. The nucleus of the production organization was a central office or shop where the materials were sorted and given out and the product collected, and where certain of the operations might conveniently be carried on. The larger part of the actual work, however, was done in private homes by complementary labor.

The specialization observable in the Massachusetts North Shore and South Shore districts dates from the early part of this period — the third quarter of the eighteenth century — and was determined by the two different types of complementary labor available in the two districts. On the North Shore the sea had always been the chief source of livelihood,

due to the many good harbors. Fishermen's and sailors' wives and daughters were the labor supply for the first localized shoe industry, and the district specialized on women's shoes because the sewing on them was better suited to female labor. On the South Shore, on the other hand, there were few good harbors; the men stayed at home and made the best of farming. They were on hand to help out with the heavy work; and consequently — especially after the Revolution, when many of the men had learned shoemaking in the army — the South Shore district specialized in men's boots and shoes.

This specialization at such an early date suggests that in our second period, 1760-1860, *labor* was one of the chief factors of location. It was certainly of great importance; but we should remember that only those places which had facilities for reaching large markets could put into practice the division of labor that made it possible to employ low-paid home workers. The concentrated local markets and the shipping connections of the seaboard districts were until the coming of the railroads the most fundamental causes of the localization of the manufacture of shoes. A few interior points were so remote from cheap transport connection with the eastern seaboard that they made their own shoes, but this applies practically only to the frontier zone. The rest of the country bought its ready-made shoes from Massachusetts, New York, New Jersey, or Pennsylvania, and made locally only the custom product.

The most important event in the period 1760-1860, for present purposes, was the coming of the railroad. It cheapened land transportation and greatly hastened the westward march of the center of population and the building-up of cities in the interior.

One effect of the new cheap form of land transport was to reduce radically the extent of the commercial advantage of the seaboard cities. No longer were they the only ones that could tap distant material sources or serve extended markets. New England in her little corner felt the turning of the tables most severely, since she had led in the coastwise shipping

trade and now found herself most remote of all from the rapidly developing centers of population to the west and south.

By means of railroads, a manufacturing plant located in any important city or town could serve national markets. The older districts' marketing advantage, which had made them the seats of the first localized shoe industry, was nearly done away with. Not completely, it is true: there was still a much higher concentration of population and markets in the northeastern region than elsewhere, and also water transport was still cheaper than rail. But if Massachusetts, New York, New Jersey, and Pennsylvania were to retain their leadership in the ready-made shoe industry it would have to be by virtue of some other advantage.

Such was that of labor supply. The newer parts of the country were preoccupied with agriculture throughout this period. Midwestern cities were commercial centers serving the surrounding farming regions. A surplus labor supply willing to sell its services cheaply to manufacturing industry was lacking. Furthermore, there was no experienced shoemaking labor at any price in the newer regions, except the local custom shoemakers. They could not compete with the eastern large-scale production of cheap shoes.¹

In the East, on the other hand, nearly a century of specialization in shoemaking was reflected in a relatively high level of competency on the part of the workers. They had not only carried on the same operations for generations, but they had lived and breathed in the atmosphere of shoemaking and were a part of an organism difficult to transplant. A still further factor tending to keep the shoe industry localized in the East even after the loss of special marketing advantages was the financial one. Shoes were sold, in the rural markets, on long credits, and correspondingly long credits were allowed the middlemen. The capital required was not as cheaply obtainable in the West as it was, for example, in Boston, the

1. In pre-Civil-War St. Louis, for example, the idea was prevalent that the city could never be anything more than a distributing center. See J. T. Scharf, *History of St. Louis City and County* (Philadelphia, 1883), vol. ii, p. 1322.

financial center of the country, or in New York, about to succeed to that position.

For the foregoing reasons the cheapening of land transport did not immediately decentralize the industry. Rather, by reducing the importance of nearness to markets, it brought into greater prominence other factors such as relative labor costs, and the localization in the original eastern districts persisted, tho on a somewhat different basis than before. Only a few outside cities went into wholesale shoemaking before 1860, and the production was almost entirely for local needs. The East had the eastern market, and most of the southern and western, all to itself.

In the latter part of the period 1760-1860, however, there are signs of a transition to a further stage. The westward spread of population made the original producing districts, and particularly New England, more and more remote from the center of the country's markets, which was a disadvantage tho not yet a decisive one. The supply of leather, too, began to be drawn from farther afield. Local eastern supplies of tanning materials had long been insufficient, and first the hides and then the tanbark had to be sought in more remote places. Tanneries were located with reference to hemlock, oak, or chestnut bark supplies, and as the bark was used up they moved southward and westward. The interior regions were also beginning to furnish an important part of the supply of hides.

Still more important, new machines were being introduced in the shoe trade at frequent intervals, and each new machine meant that one more process was consolidated in the central workshop, which gradually metamorphosed into the modern factory. The standards of labor skill were lowered by this mechanization, and in an increasing number of processes no previous training was needed. At the same time the West was developing in spots a saturation of population with respect to agriculture, and a surplus labor supply not unlike that which had helped the establishment of the original localized shoe industry on the eastern coast. With labor as well as capital becoming relatively cheaper and

more abundant in the West, and with the requirements of previous training becoming less important, it was only a question of time before the western cities likewise could develop a localized shoe industry and compete in the national markets.

Third period (1860-1900). I have dated the beginning of a third stage of location by the introduction of the McKay sewing machine, which more than any other made the central shop a genuine factory and reduced the requirements of labor skill.² By the later sixties, the factory manufacture of shoes was firmly established in such interior cities as Rochester, Cincinnati, Detroit, Chicago, St. Louis, and Milwaukee. The two first-named, farthest east, naturally led. Among all the midwestern cities the ones which by their promising prospects just previous to the Civil War had attracted a large share of the immigration from Germany were the ones to go farthest in the shoe and leather industries, since the Germans included a high proportion of village craftsmen skilled in these and other trades.³

Everywhere that there was some concentration of population and a surplus labor supply, however, it was now possible to start shoe factories. After about 1880 the Massachusetts output increased less rapidly than that of New York and the midwestern states, and after the War it suffered a serious absolute diminution. Pennsylvania and New Jersey likewise have lost in relative importance in the past half century.⁴

There was naturally a difference in quality of product, reflecting the difference in the labor available in the old and

2. Even with the machine it requires a trained workman to do McKay sewing; but the proportion of the total force engaged on that operation was very greatly lessened by the introduction of the machine.

3. In 1870 the German-born in the United States, making up 8.5 per cent of the total population, included 25.9 per cent of the boot and shoe makers. (From data in Census of 1870, vol. i, pp. 705, 711.)

4. See Table I. Examination of the figures will bear out the conclusion that the shoe industry in New Hampshire and Maine has less in common with that of Massachusetts than with that of, say, Wisconsin and Missouri. It would be misleading, therefore, to lump together the figures for the three New England shoe states, as is so often done.

TABLE I

DISTRIBUTION, BY STATES, OF WAGE EARNERS
IN BOOT AND SHOE MANUFACTURING, 1860-1929*

(In percentages of total number of boot and shoe wage earners
in the United States)

	1860	1870	1880	1890	1900	1909	1919	1929
United States	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Massachusetts	50.5	55.7	55.4	50.4	41.4	40.3	38.0	26.8
New York	11.2	12.4	12.1	11.5	11.1	11.1	16.4	18.0
Missouri	0.8	1.0	1.1	1.9	4.2	8.8	8.3	12.1
Illinois	1.0	1.4	1.8	2.8	3.9	3.0	3.6	7.2
New Hampshire	3.9	3.0	4.0	5.9	8.5	7.0	5.8	7.1
Ohio	3.8	2.2	2.9	4.1	9.0	8.5	6.7	6.0
Wisconsin	0.8	1.0	1.0	1.4	1.8	2.7	3.6	5.2
Pennsylvania	10.9	9.1	7.0	5.4	6.4	5.7	6.3	5.1
Maine	2.4	2.3	3.5	4.8	4.5	3.5	4.7	4.8
New Jersey†	2.3	2.2	3.0	3.7	3.1	2.4	1.3	0.7
Other states	12.4	9.7	8.2	8.1	6.1	7.0	5.3	7.0

* Computed from data of U. S. Census of Manufactures. For 1870 and 1929, the figures cover establishments with an annual product worth \$5,000 or more, while in other years all establishments with an annual product worth \$500 or more are included. The discrepancy is quite insignificant in size. For 1880 and subsequent years, custom and repair shops are excluded.

† New Jersey is included only on account of past importance in the industry. In 1929 her proportion of the total wage earners was surpassed by all the other states in the table and also by Kentucky (1.2% of the U. S. total), Maryland (1.1%), and Tennessee (1.0%).

the new shoe districts. Where the manufacture had been long established, it had become possible by the seventies to make a shoe of good quality by machinery. The custom shoemakers still shod the wealthier and more fastidious customers, but the factory product was encroaching more and more on their domain as the last processes were mechanized and the machines improved. In Philadelphia, New York, and the shoe towns of eastern Massachusetts, New Jersey, and eastern Pennsylvania, the labor was able to turn out a better grade of shoe in the factory than was possible elsewhere, tho not yet as good as the product of the local custom shops scattered over the country. Then, too, the character of the demand was different in the West and South,⁵ so those newer producing sections began by turning out a medium-

5. This applies essentially to Maine and New Hampshire as well.

or low-grade product. Gradually, as the machines were still further improved, as labor gained in experience, and as the needs and desires of consumers changed, the western shoe manufacturers began to make a product of a quality approaching that of the eastern factories. This happened first in the cities, such as Cincinnati, Chicago, and St. Louis. It was some time, however, before they caught up with the older districts.

TABLE II
VALUE OF PRODUCT IN CHIEF SHOE MANUFACTURING CITIES,
AS PERCENTAGE OF VALUE OF PRODUCT FOR THE UNITED STATES*

	1880	1890	1900	1904	1914	1919	1923
New York†.....	5.7	3.5	3.5	3.7	4.8	5.8	8.5
Brockton.....	7.3	7.3	7.6	9.4	7.0	7.1	5.3
St. Louis.....	1.0	1.9	3.2	6.0	....	5.2	5.2
Haverhill.....	7.3	5.9	4.8	5.0	5.2	3.6	....
Milwaukee.....	0.4	0.7	....	1.7	....	2.6	3.5
Lynn.....	10.2	9.2	6.5	8.1	6.0	5.8	3.1
Chicago.....	1.5	3.3	2.2	1.7	2.0	1.5	2.8
Boston.....	1.2	0.6	3.6	2.0	2.6	2.4	2.6
Manchester, N. H. ....	....	....	1.6	2.1	....	2.9	2.2
Cincinnati.....	2.5	2.7	3.4	3.3	2.9	2.7	2.1
Rochester.....	2.2	3.0	2.7	2.7	2.7	3.1	2.0
Auburn, Me.....	....	....	1.6	1.3	2.0	1.8	1.8
Philadelphia.....	5.4	3.1	2.3	1.6	1.8	1.8	1.6
Marlboro, Mass. ....	....	....	2.6	2.1	....	....	....
Columbus.....	0.1	0.2	1.3	1.7	....	....	....
Portsmouth, Ohio ....	....	....	1.6	1.3	....	....	....

* Computed from data of U. S. Census of Manufactures. The figures apply to the factory industry only, excluding custom and repair shops. Blanks indicate that no data are available.

† Brooklyn was reported separately in the earlier years, but is included here with New York throughout.

During the period 1860-1900 the situation regarding materials also changed. The process of bark-leaching, finally made practicable in the decades just following the Civil War, made it no longer necessary for tanneries to locate near forests. Instead, they were free henceforth to seek the supply of hides. This meant increased development of the tanning industry in two places: first the stockyard cities of the Middle West, and second the east-coast ports which imported hides from South America and goatskins from Europe and Asia.

Since about half the material used in the tanning industry was (and is) imported, the two leather-producing districts came to be not far from equal in importance.

The western as well as the eastern shoe industry thus had its leather supply right at hand soon after the Civil War. Furthermore, the heavier cattle leathers produced in the Middle West were suited to the character of the shoe production of that region, just as the supply of lighter kid leather in the East was adapted to the character of shoe production there.

TABLE III
INDEX OF POPULATION SPECIALIZATION
IN SHOE MANUFACTURING, BY STATES*

(Proportion of boot and shoe wage earners to total population in principal shoe states, relative to the same proportion for the United States as unity.)

	1860	1870	1880	1890	1900	1904	1909	1914	1919	1925	1929
United States	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
New Hampshire	3.8	2.8	5.8	10.0	15.4	13.8	15.1	15.6	13.9	15.0	18.8
Massachusetts	13.0	10.8	15.7	14.3	11.0	11.3	11.1	11.2	10.4	7.8	7.7
Maine	1.2	1.3	2.7	4.7	4.9	4.4	4.4	6.2	6.5	6.8	7.5
Missouri	†	†	†	†	1.0	1.8	2.5	2.0	2.6	3.8	4.1
Wisconsin	†	†	†	†	†	†	1.1	1.2	1.5	2.1	2.2
New York	†	1.1	1.2	1.2	1.2	1.1	1.2	1.4	1.6	1.9	1.8
Illinois	†	†	†	†	†	†	†	†	†	1.1	1.2
Ohio	†	†	†	†	1.6	1.7	1.7	1.4	1.2	1.2	1.1
New Jersey	1.1	1.0	1.3	1.7	1.2	1.1	†	†	†	†	†
Pennsylvania	1.2	1.3	†	†	†	†	†	†	†	†	†

* Computed from data of U. S. Census. In 1860, only male labor of 15 or more years of age was included. Data for custom and repair shops are excluded in reports for 1880 and subsequent years.

† This symbol indicates an index figure of less than 1.0, meaning that in that state the shoe workers were a less important part of the population than in the United States as a whole.

It is impossible to say whether nearness to market or low labor costs was the dominant locating factor in the period 1860-1900, since this depended on the quality of shoe. For the higher qualities the skilled labor of the East was well-nigh indispensable, and transportation costs were secondary in importance; while for the lower grades more susceptible to standardized production, western labor was good enough and perhaps nearness to market was the main thing. During the last decades of the nineteenth century the westward move-

ment of shoe production hardly more than kept up with the movement in population.⁶

The McKay machine and most of those that followed it were leased, not sold, to the manufacturers, which kept down the amount of capital required to enter the business and allowed men of small resources to get a start. Undoubtedly this aided the newer districts. A still further reduction in capital requirements was the aftermath of the greenback inflation and the Panic of 1873, which led manufacturers in general to demand cash payment from retailers or jobbers. Whereas before the Civil War Boston had financed most of the shoe trade of the country, and western centers had been handicapped by high interest rates, now all sections were on the same basis.

The equalization of advantages took other forms as well. The producers of shoe machinery, who gravitated rapidly toward monopoly and finally merged in 1899, leased the machines on the same terms to manufacturers large and small. This deprived the larger ones of the advantage which their more intensive use of the equipment would otherwise have given them, and helped to keep shoe factories small. Furthermore, the Shoe Machinery Trust gave exactly the same rates and the same service to manufacturers in all parts of the country, whereas under competitive conditions those in the concentrated eastern districts might have expected to come off somewhat better than their western rivals.

In the main the period 1860-1900 was characterized by a levelling of locational advantages in the different regions. New England's advantage in marketing had passed away by 1873, and as she was crowded out of the western markets she began tardily to seek a substitute outlet in the export field. The absence of highly-trained labor had become by the seventies not a hindrance to shoe manufacturing in general, but simply a factor limiting quality of the product. The regional

6. Compare Tables I and III. When we make allowance, as in Table III, for shifts in population, we find that the shoe industry has during the past fifty years gained in Missouri, Maine, New Hampshire, Wisconsin, New York, and Illinois, and lost in Massachusetts, New Jersey, Pennsylvania, and Ohio.

specialization by grades which we have indicated was the product of the difference in age between the eastern and the western shoe industries, and as such could not be permanent. Capital was not only more nearly equally available everywhere, but also much less in requirement than before.

I am frankly at a loss where to end the period beginning in 1860; 1900 has been set down as the terminal year, but one can point to no single event to justify the demarcation. In some respects a definite change to a new state of affairs had manifested itself by 1890, or even earlier; in others it was not clear till long after 1900.

Fourth period (1900-). The two new developments that seem to justify calling the most recent decades a separate period in the location of the shoe industry are the emphasis on styles and the rise of labor unions to power. Both began half a century or more ago and rose in steady crescendo to their present great importance.

Fashions in footwear evidently could have little effect on the ready-made shoe industry before it had become possible to turn out in the factory a product of fairly high grade, approaching that of the hand shoemaker. Between 1880 and 1890, roughly, this happened; events conspired to set the wheel of fashion in rapidly accelerating motion. The factories became able to turn out good enough shoes — in fact they took prizes at international exhibitions, where styles in women's shoes were already American rather than Parisian. The tanneries at the same time had mastered new processes of treating skins, and a host of new and ornamental varieties of light upper leather began to grace the market. Public taste came to demand greater variety and more frequent alteration of patterns.

The steadily increasing importance of fashion changes in shoes has brought many problems to the shoe industry, but for our purposes here the most significant effect has been the emphasis that has been put upon speed and easy contact in marketing. Once before, nearness to market had meant low freight rates and that had been a decisive advantage. This advantage the railroads had ironed out. Now that speed

became necessary, the factor of access to areas of consumption regained importance.⁷

More elaborate styles and quicker change in them meant that the merchandising of shoes, wholesale as well as retail, must be done in a much less offhand way than before. Except in the steadily less numerous staple lines, holding of stocks became impossible. The manufacturer on the spot, who could keep his ear to the ground and give quick and almost personal service, served a territory better than some far-away establishment whose shipments might arrive too late to catch the Saturday rush.

Since New England was farthest away from the markets that were growing the fastest, she was the chief sufferer by this new importance of the factor of nearness to market. Her water transport lines were now of practically no use at all for the carrying of shoes, speed rather than low freights being the essential. Furthermore, the high degree of specialization which was the outcome of the concentration of the industry in eastern Massachusetts, in particular, began to work adversely. The rural and small-town markets of the interior wanted a general line of shoes, whereas most Massachusetts manufacturers had small factories each wholly devoted to a single specialty. Then too, they were harder hit by the seasonal fluctuations in sales which became more and more pronounced.

New England, having lost one of her special advantages by the coming of the railroads and another by the improvement of machinery, now was subjected to a positive disadvantage in reaching a growing section of the market.

In the nineties the eastern Massachusetts manufacturers began, probably as a result of the reverses suffered in the domestic market, to show an interest in export trade, neg-

7. For instance, I was told at a factory on the edge of the Chicago Loop district, producing high-grade shoes, that its location was advantageous primarily by reason of the nearness of the railroad terminals and hotels used by visiting buyers. From any other point of view a less central Chicago location would have been equally good, and for a producer of medium- or low-grade shoes there might have been a net advantage in being out of the city altogether.

lected since the Civil War. It was too late to build up a large export business on the basis of the advantage in machinery we had once possessed, since the machinery producers had been pushing their product abroad just as zealously as at home; but the eastern shoe districts of the country, and particularly the large Brockton manufacturers, made efforts which raised the total of exports to about 5 per cent of the domestic production. The principal markets were in Cuba and South Africa. During the World War, however, these and most of the other former shoe-importing countries erected tariffs and built up their own shoe industries, so that they are now self-sufficient. International trade in shoes was sharply curtailed, and at present there seems no likelihood of our exports recovering much of their former volume. Again New England (particularly Massachusetts) is the chief sufferer.⁸

The organization of labor in the shoe industry began to exert some influence on location as early as the seventies, and nearly everywhere the story was the same. In centers of concentrated shoe production where there were several thousand workers together the conflict of interest between them and their employers resulted in city-wide strikes. At first the grievance was often the allowing of "green hands" to run the machines; occasionally it was the machines themselves; but usually it had to do with wages or working conditions. Labor has always been strong in shoe manufacturing, because of its intrinsic importance in the production process and also because of the peculiar conditions that have brought it about that the representative manufacturer is a man of small resources competing savagely with his fellows. Manufac-

8. The Foreign Trade Survey of New England published by the Bureau of Foreign and Domestic Commerce in 1931 tells us (pp. 10-12) that in 1928 New England furnished 69 per cent of the national total of leather footwear exports, a percentage larger than in any other product. Since the bulk of this probably came from the Brockton district, it is plain to be seen that that district had a very much larger relative stake in export trade than any other. According to the 1927 Census of Manufactures, in that year the three New England shoe states produced 34.3 per cent of the national output by value; Massachusetts alone produced 25.1 per cent.

turers' associations exist in all the important shoe centers, to be sure, and in a few of them have effectually hamstrung the unions; but in general the employer is even more afraid of his competitors than of his workmen.

The strength of labor in the larger shoe centers raised labor costs there and caused manufacturers to move elsewhere for cheaper and more tractable labor.⁹ A good many found that the advantages of concentration — or agglomeration, as Weber calls it — were too great to be foregone, and moved back; but there was a steady trickle out into the country towns, with their cheap unorganized labor, and also to the metropolitan cities like Boston, with their unspecialized labor market and better conditions for the manufacturers. Organization followed the paths of the migration, of course. Beginning in Philadelphia, it spread rapidly in self-defence to the competing lower-cost centers in New York and New Jersey, and a little later the Massachusetts shoe towns were organized. In the Middle West, Rochester and Cincinnati became union centers comparatively early, but in Chicago, Milwaukee, and St. Louis the manufacturers at last reports still had the upper hand.

The manufacturers in already unionized shoe towns have displayed an illuminating lack of solidarity with their fellows in other localities. While striving to keep down the power of labor organizations in their own cities, they have welcomed the spread of unionism to competing centers and the consequent easing of their own competitive position.

As a locational factor, the higher costs resulting from organized labor have worked within rather than between regions. The gap between Philadelphia and Cincinnati proved much easier to bridge than that between Haverhill and Georgetown. The effect has been to check the industry's growth in the more specialized centers in each of the chief producing states, and to stimulate it in the satellite towns

9. See for instance Bulletins 384 and 483 of the Bureau of Labor Statistics: *Labor Conditions in the Shoe Industry in Massachusetts, 1920-24* (Washington, 1925), and *Conditions in the Shoe Industry in Haverhill, Mass., 1928* (Washington, 1929).

and in such towns and cities as have escaped strong unionization.¹ Philadelphia, Brockton, Lynn, Haverhill, Rochester, Cincinnati, and St. Louis have all become less important relative to their tributary territory. The cities that have gained by the movement have been those of New Hampshire and Maine, Boston, New York, and recently Chicago. In the case of the last two or perhaps three, the market factor was an added attraction, since these cities are style and distribution centers as well as leather markets. A considerable part of the shoe industry of New York City is hand work for the custom and specialty trades: a line of work which has shown an increasing tendency to centralize there. Something similar is beginning to be true of Chicago.

The movement toward decentralization has been somewhat aided by the inducements which community organizations and city and state governments have offered to new factories. These include lower taxes or exemption for a period of years, free rent, free buildings, or even cash bonuses.

Looking ahead, I see no signs of an imminent shift in the fundamental basis of location. The present importance of close contact with and speedy access to the market will certainly continue, tho chain marketing organizations may be able to simplify national distribution and equalize advantages in this regard. Foreign trade is likely to remain of small importance. Exports are dead, and willing hands will boost the tariff if imports threaten again as they did in 1929 and 1930. Labor is a relatively stable factor, particularly since mechanization of processes seems to have reached the limits allowed by the variety of styles that consumers insist upon.²

1. It is interesting to note that the moving of cotton mills from some Massachusetts towns and cities has afforded advantages, in the shape of cheap vacant factory space and cheap labor, for new industries. Lowell, for example, has become quite a respectable minor shoe center in recent years. The factor of cheap labor should not be given too much weight here, however, since the shoe industry demands a somewhat higher type of labor than that left in the wake of the textile mills.

2. The maximum efficient size of factory unit seems to be reached with a capacity of a few thousand pairs a day, or less than one tenth of one per cent of the total shoe factory capacity of the country (which, by the way, is nearly triple the average production). With few excep-

Further standardization of the actual processes of manufacture could not go much farther unless styles were to be controlled or a homogeneous substitute material, combining the virtues of rubber and leather, were to be discovered. As for labor organization, it is at present in what may be temporary eclipse, with wages and membership rosters going down everywhere. Under more normal conditions we should expect the process of expansion of organization to continue and to bring about a closer equalization of labor cost levels. If this went far enough, the trend of decentralization would be halted.

In the writer's opinion the locational history of the shoe industry in this country lends inductive support to the Weberian theory, while at the same time showing wherein the theory falls short of affording an adequate basis of explanation. The five preliminary deductions set down on pages 256-7 above are all borne out by the historical sketch. The reader will recognize that they cover much ground.

Three important defects of explanation on the basis of the Weberian theory appear in the case here examined. First there is the fact that for this industry the attraction of market and, to a lesser extent, of materials, is more than a matter of transportation costs, and much more than a matter of physical distance. Speed of delivery and contact with leather markets, shoe buyers, and style sources are in most cases more important than freight rates. The difficulty is to express these factors as money costs and as functions of distance; the complexity of the problem will readily be appreciated.

I do not mean to imply that the existence of such factors in any way invalidates the theory, which provides a perfectly consistent way of evaluating them. But this part of the theory, as is not unnatural, has been little developed. It tells us merely that it is necessary to convert differences in transportation speed or service, for example, into their equivalents in money costs and these in turn into equivalent distances according to the rate schedule measuring transportation. Larger shoe factories are found to be divided into two or more separately operating units.

costs in the restricted sense. The theoretical skeleton is there, but the process of clothing it with flesh has not gone far. It is fair to add that for other industries, where the product is bulkier or more standardized, this part of the theory is much less difficult to apply.

Secondly, there is the matter of the factors of location which make up that pair of complex tendencies, Centralization and Decentralization. And here the theory is very unsatisfactory. After all, the central purpose of a theory of location is to give us a means of expressing in common units, and thus of weighing against each other, the locating forces which everyone already recognizes as such. Weber himself gathered all the general³ factors associated with centralization and decentralization into one assumed net force of "agglomeration." By limiting himself to general factors, however, he left the way open for introducing *ad hoc* such specific locational causes as might be found to work on particular industries or in particular circumstances. Later critics have justly pointed out⁴ that there is no justification in principle for combining locational factors of widely diverse nature which may or may not have an essential connection with centralization of industry. Accordingly, they resolve Weber's "agglomerative force" back into such individual factors as auxiliary material and market transport advantages, lower labor costs, "advantages of contact," and the like.

But in so doing it is hard to avoid making the problem of the theoretical resultant of all these forces hopelessly complicated. Weber's theory, even when it dealt merely with the transport-cost factors (material and market), the attraction of low labor cost, and advantages of concentration, was

3. Weber uses the term "general" to denote "factors of location which are applicable to a greater or lesser degree in every industry," and to exclude those which "spring from the specific characteristics of particular industries; . . . which we do not recognize in advance, and can ascertain only by investigation." See Alfred Weber's *Theory of the Location of Industries*, English translation by C. J. Friedrich (Chicago, 1929), pp. 23-24.

4. See W. Sombart, "Einige Anmerkungen zur Lehre vom Standort der Industrien," in *Archiv für Sozialwissenschaft und Sozialpolitik*, May, 1910, p. 757; also Ritschl, p. 824.

already a sufficient tax on the imagination. The introduction of more and more variables makes quantitative evaluation so difficult that there is danger of the theory regressing into a listing of the different things which have a bearing on industrial location. Of this there was plenty before Weber. If the factors at work are broken down so minutely that it becomes impossible to formulate rules for their resultant effect, what we have is no more a theory than a heap of bricks is an architectural achievement.

The case of the shoe industry, where the factors of centralization and of locational inertia are strong, brings out this weakness.

Lastly, the theory leaves much to be desired in its treatment of labor costs. Here a satisfactory explanation of the distribution of quantities and qualities of labor is lacking. Given certain differentials in wages, productivity, and restriction of working conditions, we can indeed measure fairly well the labor-cost advantages of different localities, and even the effect on location. But there is no adequate theory of how those differentials themselves come into being. This is one of many questions on which economists, geographers, and census directors should coördinate their efforts.

As regards the particular case here examined, these few general observations must suffice. The last word on the relation of the shoe industry to the Weber theory at large cannot be said until other cases also have been examined and compared. I hope at a later date to present some criticisms and developments of the theory based on a wider survey.

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THE PROCESS OF INDUSTRIAL CONCENTRATION

SUMMARY

The nature of the process of concentration, 277.— The changing relative importance of different influences making for concentration and the various means of effecting concentration, 278.— I. The effect of each method of concentration upon the efficiency of production, 282.— (A) Effect when aimed at securing economies of production from operation on a larger scale, 282.— (1) Price cutting, 282.— (2) Expenditure aimed at increasing sales, 285.— (3) Mergers, 287.— (4) Price and output agreements, 292.— Price leadership, 292.— (B) Effect when aimed at securing market control, 292.— (1) Price cutting, 292.— (2) Expenditure aimed at increasing sales, 294.— (3) Mergers, 294.— (4) Price and output agreements, 294.— (5) Price leadership, 294.— Difference between effects of concentration to secure monopoly profits and concentration to avoid abnormally low profits, 295.— II. The effect of each method of concentration upon the distribution of gains and losses resulting from economic change, 297.— (A) Effect when concentration is aimed at economies of production, 297.— (B) Effect when aimed at market control, 299.— III. The problem of social control, 303.— Control has in the main rested upon judgment of the motives to concentration, 303.— This policy is unsatisfactory because of difficulty of application, 307.— And because it influences mainly the forms of concentration, 307.— The ultimate consequences of concentration are the most satisfactory basis for social control, 309.— Control upon such a basis will give prominence to very fundamental problems which must be faced, 309.

Progressive concentration of the control of economic resources is one of the most outstanding characteristics of industrialization. The analysis of the nature, causes, and consequences of this concentration is, however, very far from complete. It is true that the process by which control of the economic resources vested in corporate groups has been restricted to a few members of each group, and the extent of that concentration are now receiving attention.¹ This paper is concerned, however, with the process by which control of the economic resources in industries as a whole has been con-

1. Vide Means, *The Separation of Ownership and Control in American Industry*, *Quarterly Journal of Economics*, XLVI, 68.

centrated in a diminishing number of business units. It is proposed to exclude, as far as possible, consideration of the present extent of this concentration and its probable consequences, in order to analyze more fully the nature of the process of which the present situation is the outcome.

The process of concentration in this broader sense consists of the mutual interaction of certain influences making for change in economic organization on the one hand, and certain forms of behavior or devices (legal or illegal) for making such changes on the other. The response of the productive organism to stimuli to change is determined by the types of response available and to which individuals are prepared to resort.

The most important forces making for the concentration of control are (1) the desire to profit from the exploitation of improved methods of production involving operation on a larger scale, and (2) the desire to profit from the control of market prices. This latter stimulus may be active where a rate of return above the "normal"² is thought to be obtainable, or where the amount of specialized and durable equipment in an industry is so great (owing to unanticipated decline in demand or failure of anticipated increases to materialize) that, if it were all utilized to the full, the resulting revenue from sales would yield less than a normal profit, and it is believed that price control can move the rate of return towards the normal. Of these two stimuli the first, namely, the desire to exploit more economical and larger scale methods of production, has increased in importance during the process of industrialization.

During the later stages of industrialization the variety of methods of bringing about concentration has been considerably increased. That price cutting (the sole means of adjusting the allocation of economic resources in static equilibrium systems of economic analysis) has ceased to be the only means of redistributing control of resources, is indicated by the sporadic and imperfect statistical evidence available. Ex-

2. I.e. the rate of profit the anticipation of which is just sufficient to attract investment into industries of similar risk and general attractiveness to investors.

penditure aimed directly at increasing sales (i.e. expenditure on advertising, the employment of salesmen, the giving of samples, supplying gratuitous services and the like) has increased rapidly in recent years until expenditure on newspaper advertising alone was estimated to have reached about one and one-half billion dollars by 1927,³ and that on magazine advertising one hundred seventy-eight million dollars by 1930. Statistics collected from four hundred fifty manufacturers show that during the three years from 1924 to 1926 expenditure upon advertising increased by 24.6 per cent, which was faster than the rate at which any other element of cost was increasing.⁴ The practice of "dumping" goods at places distant from the point of production at prices which yield, after allowance for transportation costs, less than sales to nearer delivery points ("freight absorption") may constitute local price cutting. "Dumped" goods are, however, frequently sold at the price at which the most advantageously situated rival can sell at the point of delivery. The practice is then shorn of any element of price cutting, but it involves expenditure upon transportation aimed at increasing the volume of sales and must, therefore, be classified with other expenditures with the same objective. Such expenditure is common in the cement, steel, and probably other industries and has been roughly estimated to have reached \$42 millions in 1927 in the cement industry.⁵ Price cutting and expenditure upon inducing purchases, altho not necessarily part of a plan the immediate and principal object of which is the concentration of control, operate through a tendency to change the distribution of business between sellers and must for that reason be regarded as a means to concentration. They may, of course, be ineffective, either because ill conceived, or because neutralized by equally well conceived efforts of a similar kind by rivals.

3. National Bureau of Economic Research Recent Economic Changes, 402.

4. Curtis Publishing Company, Leading Advertisers, 1922-1931; Federal Trade Commission, Resale Price Maintenance, 1931, II, 23.

5. Federal Trade Commission, Price Bases Enquiry, 1932. 142; and address of Charles M. Schwab to American Iron and Steel Institute, May, 1926.

The third method of concentration is the merger,⁶ the increasing importance of which is indicated⁷ by the fact that the number of firms disappearing through mergers in manufacturing and mining was about 140 per cent greater in the depression year 1930 than in the depression year 1922.⁸ The fourth method of concentrating control consists of agreements between firms concerning prices and output. While such agreements leave many of the functions of management with the separate firms, they concentrate the most vital of them and often affect a larger proportion of the industry than mergers. The extent of resort to such agreements and to understandings of a less definite kind aimed at the same result is not easy to estimate because of their illegality, except in the shipping and marine insurance industries.⁹ They are, however, probably of considerable importance,¹ especially within small geographical areas. The fifth method

6. "Merger" is used (in a sense broader than the legal definition) to mean the transfer of the future allegiance of all customers of a particular class (as to commodities purchased) from an economic unit controlled by one group to a unit controlled by another group by such devices as the purchase by one unit for cash or by an exchange of stock of a controlling interest in another, the unification of the control of such units through a holding company or trust, and the purchase of assets for stock or for cash where the goodwill or firm name is included in the purchase.

7. While mergers vary in the degree of concentration which they bring about owing to variations in the size of firms affected, there is no reason to suppose that mergers have so changed in this respect as to invalidate the above conclusion. See Watkins' *Industrial Combinations and Public Policy*, 317.

8. Thorp, *The Persistence of the Merger Movement*. The Papers and Proceedings of the Forty-Third Annual Meeting of the American Economic Association, 78. Peaks were reached in 1920 (760 firms disappearing) and in 1929 (1,245 firms disappearing). The purchase of branches or subsidiaries from other firms was unfortunately not included, on the ground that such transactions do not further the concentration of industry.

9. Shipping Act 1916. Merchant Marine Act 1920.

1. The Federal Farm Board is apparently prepared to encourage the use of Coöperative Marketing Associations to control both the amount of crops produced and the amount sold. (Federal Farm Board Second Annual Report, 1931, 59-61.)

of concentrating is the establishment of price leadership, that is, the acceptance by most firms in an industry of the price policy of one, usually the largest, firm in the industry. Such leadership concentrates the function of making price and production policy in the hands of one firm. Again the extent of resort to this method cannot be precisely determined, but there is considerable evidence² of increasing resort to the acceptance of the dictates of an industrial "czar." The principal methods by which concentration is effected may be summarized therefore as (1) price cutting, (2) expenditure aimed directly at the inducement of sales, (3) mergers, (4)

2. Evidence suggesting the presence of price leadership is available in relation to the following industries:

Oil (Federal Trade Commission Prices, Profits and Competition in the Petroleum Industry, 1928, 229, seq., 239. Price of Gasoline in 1915, 156. Pacific Coast Petroleum Industry, 1922, II, 30, 78, 127. Letter of Submittal of Report on Gasoline Prices in 1924).

Agricultural implement (U. S. v. International Harvester Company, Brief for U. S., 17, 91. U. S. v. International Harvester Company, 274, U. S. 693 (1927)).

Newsprint (Federal Trade Commission, Newsprint Paper Industry, 1930, 5, 81).

Steel (Federal Trade Commission v. U. S. Steel Corporation before Federal Trade Commission, Docket 760, Statement of Case I, 327 (Pittsburg Plus Case). Also U. S. Petition for Rehearing, U. S. v. U. S. Steel Corporation, 13).

Anthracite (U. S. v. Reading Company (1911), Record III, 1060. U. S. v. Reading Company (1920), Brief for U. S., 193.)

Can making (U. S. v. American Can Company, 230 Fed. 891, Summary of evidence, 168).

Fertilizer (Federal Trade Commission, The Fertilizer Industry, 1923, 58. The Fertilizer Industry, 1916, 218, 219.)

Corn products (Federal Trade Commission Report on Commercial Feeds, 1921, 173. U. S. v. Corn Products Refining Company, 234 Fed. 975, 993 (1916)).

Meat packing (Federal Trade Commission, Meat Packing Industry, I, 114). (The interstate wholesale slaughterers were said to accept the lead of the large packers as a group.)

Non-ferrous metals (Fetter Masquerade of Monopoly, 202. Sakolski, 3, Harvard Business Review, 207).

Canned salmon (Federal Trade Commission, Report on Canned Salmon, 11).

Bread retailing (Hearings on the Prices of Food Products before a Sub Committee of the Committee on Agriculture and Forestry of the U. S. Senate (1930), 162, 164).

Sugar retailing (Ibid., 162).

agreements concerning price and output and (5) price leadership. Some of the practises commonly regarded as "unfair competition" and reviewed by the Federal Trade Commission under section five of the Federal Trade Commission Act should doubtless be included, but they are so varied in their nature that limitations of space forbid any detailed analysis of them.

The change in the relative importance of the objectives of concentration, and, more particularly, the increasing variety of means of concentrating control, suggest the desirability of analyzing the economic effects of each method of concentration with the ultimate object of assessing the satisfactoriness of social control of industrial concentration in the past and suggesting a desirable policy of control in the future. This paper will proceed, therefore, to analyze (I) the effect of each type of response upon the volume of production, (II) their effect upon the distribution of the outcome of production and (III) the problem of social control.

I

THE EFFECT OF THE METHOD OF CONCENTRATION UPON THE EFFICIENCY OF PRODUCTION

The different methods of concentration vary in the magnitude of the change in the allocation of economic resources which they bring about, in their sensitivity to a given stimulus (some facilitating response to a smaller stimulus than others), in the speed with which they permit change, and in the manner in which they select business units for survival in the succeeding time period. The effect of each method varies, however, according to the circumstances in which it is used, i.e., according to the nature of the stimulus to which it is a response. It is necessary, therefore, to consider the principal stimuli in turn and the effect of the use of each of the methods of response thereto.

A. CONCENTRATION AIMED AT ECONOMIES OF PRODUCTION

(1) It is often assumed that price cutting is the best method of bringing about concentration aimed at the reduction of

costs by utilizing new knowledge concerning technical methods of manufacturing, marketing or management, where such knowledge demands for its utilization organizations controlling a larger volume of the resources of production.³ There is serious question, however, whether the greatest efficiency of production is now obtained by this route. In the first place, if any innovating firm increases its capacity for production by adopting the new methods and then reduces prices in order to attract the necessary additional business from its rivals, the latter may respond by adopting, as quickly as their knowledge and financial circumstances permit, the methods of the innovator. If *all* the rival producers follow this policy a "normal" rate of return upon the increased investment in the industry as a whole can be obtained only in a peculiar combination of circumstances. At a price equal to the cost of production (including a "normal" return on investment) when the new equipment is fully utilized demand must equal the increased capacity of the industry for production. If the demand is not sufficiently elastic over the range within which prices are thus reduced, a normal rate of return cannot be obtained. Nor is it necessary that all rivals adopt this policy. The greater the increase in the scale of operation demanded by the new knowledge, the smaller the number of rivals adopting the new methods that will prevent normal returns upon the new investment. Price competition, therefore, while bringing about the concentration of control necessary to permit the adoption of improved methods of production, may, and in practice often does, temporarily reduce the efficiency of the industrial organism as a whole by causing the diversion of excessive quantities of the means of production into industries in transition.

In the second place, in the imperfect markets of the business world, price cutting is not always the most sensitive of

3. Larger scale operation (or the concentration of control over greater quantities of economic resources) may involve either the performance of a function or functions upon a larger scale or an extension of integration, i.e., the inclusion under unified control of a greater variety of processes altho none need be carried on on a larger scale than formerly (except those formerly not carried on at all).

responses to the stimulus to improve the technique of production. Its sensitivity is best measured by the extent of the prospective profit from innovation.⁴ This profit is determined by the extent of the reduction in unit costs expected to result from the new methods, after allowing, however, for the losses due to the obsolescence of existing equipment and for the prospective movements of the price of the product for some time into the future. In so far as buyers are not cognizant of all the offers available, are uncertain concerning the qualities of all units sold under the same name, or are affected by emotional loyalties to sellers, buyers tend to continue business relations with those with whom they have long dealt, even tho an innovating firm is offering to sell at a lower price. The innovator, therefore, must reduce the price sufficiently to overcome this inertia on the part of buyers. But the inertia of rival sellers is equally important in most actual markets. If the price cut of the innovator is large enough to attract business from his rivals, they are likely to reduce their prices to the level set by the innovator. His price cut ceases to attract business from them and he must rely for additional business upon the increase in aggregate demand due to the reduction in price. The extent of additional business obtained from this source depends upon the elasticity of demand for the product and the extent to which rivals are equipped to accept additional business, and should it fall short of the amount needed to keep his organization fully employed he must either abandon hope of securing the possible reduction of costs⁵ or face a series of price reductions giving rise to "cut-throat competition" and a serious reduction of revenue. The estimated duration of these losses of revenue and of his inability to realize the lowest possible costs is determined by the speed with which his rivals are expelled from the industry by

4. Fear of losses due to innovation by others may also stimulate innovation: there is, however, no evidence of the frequency with which business men are so motivated to innovation.

5. It is conceivable that the costs of the innovator exceed those of his rivals: the costs of the large organization partly employed may be greater than those of smaller organizations more fully employed.

lack of financial success.⁶ The sensitiveness of price cutting is diminished, therefore, by the inertia of both buyers and sellers, the cost of overcoming which diminishes the profits of innovation below the amount of the reduction in unit costs offered by the new methods. Unless the economies offered by the new method are sufficient to overcome this obstacle, the new method may not be adopted at all if price cutting is the only means of concentration available.

In the third place, price cutting does not always operate as effectively as is suggested by many defences of "free competition" to select for survival in each industry, during periods of transition, the most efficient firms. It is true that in so far as the innovator succeeds in securing profits from innovation, even in spite of the imperfection of the market, price cutting secures his survival. But is the distribution of losses between his rivals such as to select from among them the most efficient? The major determinants of the amount of the loss thrown upon each rival by price cutting are the point in the life of the more important items of specialized equipment of each firm at which the price reduction occurs, their freedom of access to the capital market, and their financial structure. The more nearly exhausted are the principal assets, the smaller the loss due to obsolescence. Lack of access to the capital market may prevent a firm from securing capital to enable it to equip itself on the larger scale demanded by the new methods and force it to abandon its existing business connections. High fixed obligations may force a receivership, which, while it may not eject from the industry the equipment of the firm, may eject its management. These factors have little necessary relation to the probable operating efficiency of the firms.

(2) Concentration of business by expenditure aimed directly at securing additional sales is no more effective than price cutting in preventing excessive investment. All or an excessive number may establish plants or firms of the new optimum size and resort to sales campaigns to secure the busi-

6. If rivals go out of business but their equipment passes at a receiver's sale a new firm enters the business, but the new firm may or may not retain the business connections of its defunct predecessor.

ness needed to keep the plants occupied. Moreover, such expenditure attracts resources available for production away from more directly productive uses into that of overcoming the inertia of buyers — a use in which the expenditures of different sellers may, for a period, be mutually neutralizing. But in so far as the imperfect rationality of buyers obstructs the concentration of business, expenditure on sales campaigns may be a less costly means of shifting the allegiance of buyers than price competition and may, therefore, in some industries be sensitive and speedy enough to permit innovations in production that would not occur if price competition were the only possible means of concentration. Direct evidence that such expenditure is more effective than equal sacrifices of revenue (in the form of price cuts) with the same objective is not available. But if advertising expenditure be selected from all forms of expenditure on sales promotion, such information as is available suggests that, even in industries where advertising is commonly regarded as excessive, the expenditure thereon is not of such a magnitude as would permit any great reduction in price if price competition were substituted for advertising.⁷ Such advertising was, moreover, not all motivated by the desire to utilize more economical methods of production.

Concentration by such expenditure has a peculiar selective effect. Lack of precise knowledge concerning the probable reactions of potential buyers to such campaigns introduces a very large element of chance into the distribution of gains and losses resulting from industrial reorganization and therefore into the selection of firms for survival. In so far as skill in such campaigns exists, the degree in which firms possess it may determine which firms survive during a period of transition. But these firms are not necessarily the most efficient

7. The total advertising costs of a considerable number of manufacturers, wholesalers and retailers during the year 1926 were reported to be 6.34 per cent of the retail price of drugs, 2.30 per cent of the price of groceries, 2.26 per cent of the price of hardware and 7.39 per cent of the price of dry goods. (Federal Trade Commission Report on Resale Price Maintenance, 1931, II, 200.)

during periods when increased concentration of business is not a matter of prime importance.⁸

(3) The merging of firm with firm to facilitate larger scale operation affects the efficiency of production differently from either of the foregoing types of market behavior. In the first place, the danger of attracting an uneconomical amount of material equipment into industries in transition can be diminished, if not altogether avoided. Where economies are expected from the adoption of new methods of management or marketing the danger may be altogether avoided. Where new methods of production in the narrow sense are the basis of the anticipated economies, the merged firms are removed as potential contributors to excessive investment, and in so far as those seeking to bring about mergers find it cheaper to absorb firms whose principal specialized equipment is nearest to exhaustion, those most likely to adopt new methods under a regime of price cutting are removed.

In the second place, the merger is a speedy method of overcoming the imperfections of the market. Control is concentrated without any buyer being induced to change his allegiance or any seller being driven from the market. This increased speed probably means a diminished cost of concentration, i.e., that the merger is also more sensitive than either of the foregoing, and facilitates improvements where the prospective reduction in unit costs is less. The cost of overcoming the imperfections of the market takes the form not of losses of revenue due to price reductions, nor of increased expenditure on promoting sales, but of a capital cost represented by the excess of the payment made for the firm acquired over the capitalized value to the acquiring firm of the earning power of the assets (excluding goodwill) taken over. The maximum sum that the innovator will be prepared to pay to

8. The emergence of business firms specializing upon advertising campaigns necessitates modification of this argument. During the period of transition these specialized qualities of sales campaign management can be secured and when the transition is effected they can be again dispensed with. To survive, the firm must at least be able to select competent assistance in sales promotion. The existence of such firms tends, however, to increase expenditure upon such activities.

acquire the additional business will be the sum of the discounted earning power of the assets taken over, allowing for the unused assets already possessed by the purchasing firm,⁹ together with the estimated cost of attracting the business by price cutting or direct expenditure. The minimum price which the firm to be absorbed will be likely to accept is the capitalized value of the estimated excess of future revenue from existing assets over future expenditure necessary to secure that revenue. These calculations will, however, allow for the existence of knowledge of more economical methods of production than the firm is equipped to exploit, and the probability that, in the event of the innovator failing to secure business by merger, he may seek it by price cutting or sales campaigns, which will diminish the earning power of rivals. In other words, the firm selling out will be unlikely to accept a greater loss than it would suffer, and the buying firm to accept a smaller profit than it could secure, if concentration were effected by price cutting or sales campaigns. The less costly the process of concentration by price cutting (i.e., the greater and more speedy the anticipated response of buyers to price cuts), the narrower the range within which the purchase price varies, and the weaker the bargaining position of the disappearing firm. On the other hand, the nearer to exhaustion are the principal assets of the disappearing firm, the less is the difference between the value of its assets to the buying and the selling firms.

The merger is probably a more sensitive response also because business men are more willing to resort to it because it casts the costs of shifting business in the form of a capital sum. The potential innovator feels able to calculate with more precision than is permitted by either of the other methods the full cost of introducing improved methods of production.¹ As the increasing specialization and durability of the

9. The acquisition of these assets may, of course, diminish the amount of new capital needed to instal new methods involving larger scale production; e.g., if it is larger scale selling that offers economies, the manufacturing plants of the merged firm may be used and the building of new plants avoided.

1. Some uncertainty will remain concerning the extent to which the

means of production renders price cutting and sales promotion both more costly than mergers and also less definite in cost, the superiority of the merger as a means of improving the efficiency of production increases.

The merger is, however, in a number of ways less favorable to efficiency because of an excessive sensitiveness. Firstly, where business is attracted by price cutting or sales campaigns, there is greater opportunity for adjusting the amount of business attracted to the newly calculated optimum scale of operation, than where resort is had to merging. The latter means of concentration necessitates expansion by just the amount of business likely to pass with the firm that can be acquired, which may fail to coincide with the amount that would have been selected by direct calculation.² Secondly, the merger carries with it a tendency positively to induce the development of concerns beyond the most economical size. The merger offers opportunities to the professional reorganizer of corporations, or promoter, who secures a speedy profit from the mere process of effecting mergers. Such promoters may accelerate the improvement of industrial technique, particularly by applying in one industrial field methods that have proved economically advantageous in others. But the blatant imperfections of the capital market, arising out of the almost complete ignorance of potential investors concerning the operations of corporations, the inability of investors to forecast the probable future profits of new corporations, and their tendency to believe (in periods of good business) that a corporation resulting from a merger must be more profitable than its constituents have been or would continue to be, provide an opportunity for promotion profits unrelated to considerations of industrial efficiency. Mergers are arranged which have little prospect of promoting economies of production of absorbed firms will pass to, and be retained by, the new consolidated unit.

2. The geographical distribution of plants and the specialization of functions between them are also likely to be less economical in a set of units brought together by consolidation than in a unit deliberately designed. (Cf. British Committee on Industry and Trade, *Factors in Industrial Efficiency*, 5.)

tion (the prospects of which, however, are usually heavily stressed at the time of the promotion) and may, indeed, during their early years, be less economical than were their constituent parts.³ If poor returns stimulate reorganization resulting in a "normal" return upon the capital of the corporation, *excluding* the amount thereof representing promoters' profits, it will have succeeded in making a large unit as economical, but no more so, than the formerly existing smaller ones. Unless the changes introduced can be applied to smaller firms or firms in other industries, these activities of the management have resulted in the application of part of the aggregate social fund of skill and knowledge available for increasing the efficiency of production to no more economically valuable an end than increasing the range of the size of the most economical firm in the industry. Moreover, they have contributed to the impairment of the market as a means of integrating productive activity as a whole and magnified already serious problems of social control. If, however, the management succeeds so far as to secure a normal return upon the capital of the firm *including* promoters' profits, these latter profits have served to stimulate the improvement of industrial organization, for the methods of operation thus developed would yield abnormally high profits on a capital that did not include promoters' profits. But even these improvements in technique yield benefits only to promoters unless rivals are able to utilize them without resort to promoters, i.e., if they resort to price cutting.

3. An analysis of the profits of 29 industrial consolidations by Professor Dewing revealed that the median aggregate earnings of the constituent companies prior to consolidation exceeded by 23 per cent the median earnings of the consolidations during their first year and by 6 per cent those during their tenth year "when the consolidation might be expected to have worked out its salvation after the addition of improvements and extensions." The median earnings estimated by promoters (allowing for economies of large scale production and reduction of competition) exceeded the median earnings of the consolidations during the first year by 40 per cent, and those during the tenth year by 53 per cent (Dewing *Financial Policy of Corporations*, IV, 224, 225). Cf. also the evidence of Albert H. Wiggin at Hearings on the Establishment of a National Economic Council before a Sub-Committee of the

Thirdly, where business men are motivated by a non-rational bias in favor of enterprises of great size and are inclined to persuade themselves that greater size will bring lower costs even tho the supporting evidence is tenuous or nonexistent, the speed with which the merger concentrates business may serve to bring into existence firms so large as to be less efficient than smaller firms, and firms that would not have been established had the enforced meditation and sustained effort involved in attracting business by price cutting or sales campaigns been imposed upon the megalomaniac directors.

The distribution of gains and losses resulting from mergers often fails to select for survival the most efficient firms. The gains from innovation are shared between the firms that are parties to the merger and the promoter (if any). Firms that do not innovate do not incur any loss or feel, therefore, any stimulus to adopt the new methods even when they have been tested by the consolidated unit.⁴ The outcome of the bargaining over the merger terms determines the distribution between the merging firms of the savings consequent upon the avoidance of resort to attracting business by price competition or expenditure upon sales pressure. In so far as the innovator secures gains from innovation, firms who improve the technique of production are encouraged. But in so far as the merger yields promoters' profits, which are determined more by the expected attitude of potential investors (poorly informed as to the past profits of the corporations being merged, and ill equipped to analyze them, or the investment opportunity offered by the new firm) than by the present value of

Committee on Manufactures of the United States Senate, 1931, I, 367. Charles E. Mitchell, *ibid.*, 529, and Melvin A. Traylor, *ibid.*, 668.

4. The difference in efficiency between the old firms and the new one may be in part offset by the addition to the capital of the innovator of the sum necessary to secure the additional business. Indeed it has been contended that the chief difference between expansion by growth and by consolidation is that the latter often involves the acquisition of relatively inefficient units at uneconomically high prices and the retention of unnecessary staff or payments for compensation for loss of office. (British Committee on Industry and Trade, *Factors in Industrial Efficiency*, 5.)

the probable excess of the profits of the merged firm over the aggregate profits of its constituent parts, the merger tends to select for survival and facilitate the operations of a class enabled by access to keen legal advice, financial information and resources to secure a transfer to themselves of the funds of the credulous and ill-formed investor.

(4) The price and output agreement does not generally operate so as to permit larger scale operation. In this respect it is differentiated from the methods of concentration hitherto discussed. After control has been concentrated by agreement, however, and during the persistence of the concentration, the probability of resort to other methods of concentration is affected. Price cutting is obstructed as a means of improving the technique of production where larger scale operation is involved, mergers may be somewhat discouraged because the fear of losses owing to the adoption of more economical methods by rivals is reduced.⁵ Where transferable quotas exist, however, mergers or the sale of quotas may be encouraged by the prospect of prices being maintained and costs reduced. Finally, price leadership is similar in its general consequences to the price agreement, altho more flexible.

B. CONCENTRATION AIMED AT PRICE CONTROL

The second important stimulus to concentration of control is the desire to secure profits or reduce losses by controlling prices rather than by reducing costs. This stimulus is, as we have seen, itself an intermediate phenomenon behind which lie the more ultimate stimuli of desire for monopoly profits or desire to stave off the threat of returns on a sub-normal level.

(1) Price cutting was resorted to as a means of striving after monopoly profits by some of the notorious trusts (e.g., oil, sugar and tobacco) towards the end of the last and the beginning of the present century. But in recent years seekers after monopoly profit have turned more often to other means

5. Even if rivals introduce new methods so long as the agreement is maintained prices are not reduced and less enterprising firms incur no loss.

of attaining their desire. Price cutting with this objective is more detrimental to the efficiency of production than when used as a means of introducing better methods of production. Firstly, the aspiring monopolist adds during the period of transition to the aggregate of equipment in the industry in order to be able to deal with the additional business desired, altho the existing amount of equipment is adequate to produce all of the commodity that can be sold at a price that covers the normal expenses of production. Should a rival firm contest for control of the market the extent of this excessive investment in equipment is further enhanced. Secondly, if successful, it tends of course to select for survival those able to finance a campaign of price cutting rather than the most efficient producers. On the other hand, however, in markets that are not perfect, the expensiveness of price competition as a means of securing control discourages a concentration aimed ultimately at diminishing the general efficiency of production. Profits are reduced during the period of transition by the inertia of both business men and purchasers, and by the absence of any prospect of economies in production. Its expensiveness is increased if rivals, alive to the reason for the price cutting, fight to shift the aim of the price cutter from absolute monopoly to price leadership. Rivals become more tenacious of their industrial life in the dual hope that the loss of revenue due to price cutting is a passing phase and that prices will be raised to a level higher than that prevailing before the price cutting occurred.⁶ They replace the more important items of their specialized equipment as they wear out, thus obstructing the efforts of the would-be monopolist. The price cutter can, however, attempt to reduce the cost of price competition by resorting to discrimination: bogus independent companies may be organized to restrict price cutting to the customers of rivals (as in the early period of concentration in the oil and tobacco industries) or price cuts may be confined to localities in which rivals are powerful.

6. Account must be taken of the possibility that the price level set by the new large firm if it acts as a leader and aims at monopoly profit may increase unit costs of production by limiting output below the full capacity of existing equipment.

(2) Direct expenditure upon sales promotion to attract business sufficient to give control of the market is as likely to cause excessive investment in the industry as price cutting and has a similar selective effect. In so far, however, as it provides a cheaper method of moving business from firm to firm it tends to facilitate efforts after market control.

(3) The merger tends to diminish the efficiency of production less than the foregoing means of concentration in that it does not attract increased investment: the physical quantity of equipment may remain unchanged while control over it is concentrated. Moreover, in so far as the cost of overcoming the imperfections of the market is less than when price cutting or sales campaigns are chosen, and more capable of precise estimation in advance, concentration aimed at control is facilitated, and the ultimate diminution of efficiency is at least facilitated. These costs are, however, increased where rivals, realizing the objective of the firm making merger offers, bargain for some share in the capitalized value of the expected monopoly profits.

(4) Price and output agreements have no tendency to induce excessive investment. Such agreements differ from the methods of concentration mentioned above in their selective effect, in that the making of such agreements tends in practice to put an end to selection. Price agreements likely to eliminate some of the existing firms are rarely made: they more frequently fix the share of business to go to each arm.⁷

(5) Analysis of the process of concentration by price leadership is difficult because of the intangibility of the final sequence of events by which price competition is replaced by leadership. These events are in the nature of a change in the habits of firms (other than the leader) concerning the basis upon which output and prices are determined. There may, however, be penultimate events inseparable from the emergence of leadership and more concrete in nature. The attainment of leadership may involve resort first to price cutting, expenditure on sales campaigns, or mergers as a means to

7. Transferable quotas make price and output agreements possible without fixing the relative position of the firms.

the attainment of either a size or a reputation for punitive action that induces the acceptance of leadership. The effects of such a preparatory campaign must be regarded as indirect effects of concentration by leadership. Some more direct effects can, however, be traced. In the first place it involves more risk of excessive investment than the merger or the price and output agreement, because the enforcement of leadership may necessitate the possession by the leader of sufficient unoccupied means of production to enable it to cut prices and take over a large proportion of the business of other firms in the event of their attempting to act independently. In the second place the selective effect of price leadership is somewhat similar to that of a price agreement. In detail, selection is influenced by both the movements in the aggregate demand for the product and by the exact nature of the functions concentrated in the leader, i.e., whether leadership is restricted to prices or extends to policy concerning expenditure upon sales pressure and methods of selling. Hitherto leadership appears to have been most effective in the field of price policy, thus leaving more scope for changes in the relative position of the firms than under price and output agreements. Experience in the harvester industry indicates that leadership does not guarantee survival to all, in the oil industry that it does not obstruct the establishment of new firms and in the oil and steel industries that it does not guarantee a sharing of the market upon any fixed basis. The adaptability of this method of concentration makes it difficult to analyze its consequences without detailed information concerning the manner in which the concentrated power is in fact exercised. And the apparent lack of uniformity in the circumstances requisite for the acceptance of leadership obstructs precise analysis of the consequence of the establishment (as distinct from the exercise) of leadership.

The stimulus to concentration may arise out of the desire to stave off the threat of subnormal profits owing to the presence of excessive capacity for production as well as out of the desire for abnormally high profits. The same responses are available when capacity is excessive as when monopoly

profits are sought, but in the former case relief may come from reductions of cost through the concentration of production in a smaller number of plants as well as from the raising of prices. In so far as reductions of cost are the objective, the broad effects of resort to each of the available means of concentration are similar to those when the same means are used to introduce improved larger scale methods of production. But there is the important difference that when any firm in an already overexpanded industry seeks to concentrate a volume of business sufficient to produce at a minimum cost, neither that firm nor any of its rivals is likely to increase its investment and increase the excess of equipment in the industry. In so far as it is hoped to avoid subnormal profits by control of prices, the effects of each of the available means of concentration are similar to those when the same means are adopted as part of a policy aimed at monopoly profits, with the general exception again that the tendency to excessive investment is diminished by the evident excess of equipment. In the main, conditions of overcapacity tend sooner or later to discourage resort to price cutting; mergers may have the attraction of more cheaply concentrating business and reducing costs but the costs of merging tend to be relatively high because firms approached to sell out are often over-optimistic concerning the revival of demand, the imminence of the collapse of rivals and the probability that the approaching firm will make great gains from the merger. The price and output agreement seems to appeal more strongly to business men than any other device when demand seriously declines. That more relief is expected from the control of prices than from the concentration of production operations in such circumstances is indicated by the vigorous campaign for the modification of the Sherman Law to permit such agreements since the decline of business which commenced in 1929.⁸ The presence of excessive capacity for

8. Cf. Swope, *Stabilization of Industry*, 1931, and the evidence of Gerard Swope at Hearings before a Sub-Committee of the Committee on Manufactures of the U. S. Senate, 72d Congress, First Session on S. 6215 (71st Congress), (*Establishment of a National Economic Council*) 308, 309, also *op. cit.*, 268 seq. Cf. also Javits, *Business and the Public*

production puts a great strain upon price leadership: the fear of the consequence of resort to price competition may, however, be strong enough to maintain leadership for considerable periods, as, for example, in the steel industry.⁹ It also renders the establishment of leadership difficult especially where there is a large number of firms, many accustomed to low profits and to working at less than full capacity. Any firm desiring to become a leader must acquire an additional volume of business great in relation to its existing business, and even then there is the fear that rivals will choose to accept business diverted from those who have raised prices.¹

II

THE EFFECT OF THE METHOD OF CONCENTRATION UPON THE DISTRIBUTION OF THE GAINS AND LOSSES OF ECONOMIC CHANGE AMONG BUYERS AND SELLERS

We now turn to the effect of the different methods of concentration upon two of the major groups in the community, profit receivers and purchasers. The consideration of the third major group, i.e., the workers, must for lack of space, be excluded.

A. CONCENTRATION AIMED AT ECONOMIES OF PRODUCTION

(1) When concentration is induced by the desire to utilize improved and larger scale methods of production, and price cutting is selected as the means of effecting the concentration,

Interest, 66 and passim. Mr. Javits holds that such agreements are not only desirable but also within the present law.

9. The strain resulting from "price concessions" (the danger of which lies in their tendency to lead to price cutting) has, however, led to a change in the method by which price competition is to be avoided. The American Iron and Steel Institute with Mr. R. P. Lamont as its executive head is to "seek stabilization of the industry in as forceful a manner as possible and endeavor to stamp out trade practices that destroy profits, disorganize trade and create bitter competition under perilous circumstances." (New York Times, August 5, 1932.)

1. Cf. Opinion attributed to the president of the National Coal Association that the repeal of all antitrust legislation "would not affect the coal industry one iota until you can get 100 or 50 or 20 operators who will agree on a program." Hearings before Sub-Committee of Committee on Manufactures of the U. S. Senate (on the Establishment of a National Economic Council), 1931, 422.

purchasers clearly benefit immediately the price cut is made, and to the extent of the price cut. Their benefit may, however, exceed or fall short of the full reduction in costs which the new methods make possible when fully utilized. If the possible cost reduction is so large, and the elasticity of demand over the price range affected is so great, that a price cut less than the possible cost reduction brings forth an increase in aggregate demand, of which the innovator secures sufficient to yield him abnormally high profits, the transmission of the full economies of production to purchasers is postponed until the innovator or rivals, actual or potential, introduce further investment suited to the utilization of the new methods. If the possible cost reduction is so large that a smaller price cut forced upon rivals speedily drives them out of business, transmission of the full economies of production is postponed until some rivals new or old adopt the newer methods, and seek more business by price cutting. Rivals may be obstructed, however, by lack of access to capital, in turn due to imperfections in the capital market or possibly to doubt whether two firms of the new optimum size could both secure a normal return. If the price cut that will speedily expel rivals is believed to exceed the possible cost reduction the innovator may make the necessary reduction and transmit to purchasers benefits in excess of those offered by the new methods. He may believe that he will not be required to maintain the price cut for long, and possibly, that when sufficient business has been attracted he will be able to raise the price for a time to a level yielding a profit above the normal, the costs of surviving rivals being in excess of his own until they are able to utilize the new methods. Or he may reduce prices by a smaller amount and face a longer period of partial utilization of his facilities for production, a policy most likely where some economies over the old methods are obtained altho the new facilities are not fully occupied. Price cutting, therefore, while it inevitably transmits to purchasers some benefits from the adoption of new methods, may be retarded in doing so by imperfections of the market.

(2) Where the innovator decides that the inertia of buyers can most economically be overcome by expenditure upon sales campaigns without any reduction of prices, the process of concentration fails to transmit to purchasers any part of the expected reduction in costs. A large part of the cost of overcoming business inertia accrues to those whose training, aptitudes, or investment qualify them for undertaking sales campaigns.

(3) Where concentration is effected by merger, and no price reduction occurs as part of the process of concentration, purchasers obtain no direct benefit from the new methods. The diminished demand of the industry for the general means of production yields, however, indirect benefits which are likely ultimately to reach purchasers.

(4 and 5) We have seen that price and output agreements and price leadership are unlikely to be adopted in order to facilitate improvements in methods of production.

B. CONCENTRATION AIMED AT CONTROL OF PRICES

Where concentration of control is aimed at securing power over prices rather than improving methods of production, and price competition is selected as the means of attaining control, purchasers benefit during the period of concentration (as they did during the price wars in the petroleum, sugar and other industries during the later years of the nineteenth and earlier years of the twentieth century). The amount of their gain is determined by the amount of the price cut found necessary to drive rivals out of business. During the period of transition, losses incurred by both the aspiring monopolist and his rivals represent gains to consumers. All other methods of concentration are sharply contrasted with price cutting in this respect. Expenditure upon sales pressure, mergers, price agreements and price leadership all operate without passing to purchasers even temporary gains.

If concentration is aimed at control of price where, owing to excessive investment, subnormal profits exist or are threatened, price cutting passes to purchasers gains in the sense that they secure, during the short run, commodities or serv-

ices at prices less than their long run expenses of production (calculated on any of the conventional accounting bases): this gain may be so great as virtually to relieve purchasers of the necessity for making any contribution at all towards the fixed costs of production. Where expenditure upon sales campaigns is substituted for price cutting these gains are diverted into the pockets of those who press sales. Mergers, price agreements and price leadership all deny to purchasers the reductions in price offered by price cutting. Purchasers secure no advantages from past allocations of resources subsequently revealed as excessive. The wastage of such resources is witnessed by the quantity of capacity unused as a result of the price policy of the merger or the associated producers, which may, however (if demand be sufficiently inelastic), yield a normal rate of return upon the abnormally large investment.

The economic effects of each method of concentration may now be summarized before passing to discussion of the problem of social control.

(1) Price cutting tends to pass to purchasers at least some of the economies resulting from improved methods of production involving an increased scale of operation, an advantage from the point of view of purchasers over every other method of concentration. Even where price cutting is a means to control of prices, purchasers receive temporary gains. Where excessive capacity in an industry gives rise to price cutting, purchasers benefit from past excessive allocations of equipment to the industry, a benefit denied them by other methods of concentration. But the imperfections of markets and the tenacity of firms make price cutting an expensive method of concentration from the point of view of the innovator, and thereby obstruct both improvements in technique and concentration aimed at control of prices. Price cutting also tends, by attracting an excessive investment to an industry in transition, to bring about an uneconomical distribution of resources, and only in a very modified degree does it tend to select for survival the most efficient firms in the industry.

(2) Expenditure upon sales campaigns aimed at concentration does not pass to purchasers any gains from the introduction of improved methods of production or from the concentration aimed at price control. But in so far as such campaigns overcome the inertia of purchasers more economically than price cutting they facilitate the introduction of improved methods (altho purchasers get no benefit therefrom) and the attainment of control of prices. Like price cutting, sales pressure tends to attract excessive investment into industries in process of transition, and, as a factor affecting the selection of firms for survival, it introduces an element of chance and a tendency to emphasize qualities which, during periods of greater stability, do not necessarily make for efficiency.

(3) Concentration by merger, like expenditure on sales campaigns, obstructs the transmission to purchasers of economies of production, but in so far as it is a cheaper method of concentration than either price cutting or selling campaigns, it obstructs less than these devices the improvement of technique and the attainment of price control. Mergers, moreover, do not tend in the same manner as price cutting and sales pressure to attract excessive amounts of investment to industries in process of concentration. They tend, however, to a different type of uneconomic allocation of resources, i.e., to the emergence of firms of an uneconomic size and structure, and to the direction of energy and skill available for the general improvement of industry into making firms of increasing size as efficient, but not necessarily more so, than smaller firms, an achievement of no economic value. The inclusion in the capitalization of consolidated firms of promoters profits is, however, capable of operating as a stimulus to increase the efficiency of industry, i.e., to make larger firms *more* efficient than smaller. If, as is possible but doubtful, those bringing about mergers select for absorption firms whose equipment or personnel is most suitable for adaptation to the new methods of production, or whose principal assets are nearest to exhaustion, the cost to

the community of introducing improvements in the technique of production is diminished.

(4) Agreements concerning prices serve no purpose in facilitating the introduction of larger scale and more economical methods of production: their function is to secure control over price policy. Used with this object they do not, like resort to price cutting or advertising, tend to excessive investment or, like the merger, give rise to firms too large to produce at the lowest costs available with existing knowledge of methods of production. But they have no selective effect: in general, acceptance of a price agreement occurs only when the prices fixed, or expected to be fixed, are such as will maintain most of the existing firms in the industry. And in their subsequent operation they weaken the tendency to pass on to consumers the benefits accruing from the adoption of improved methods and also the stimulus to seek such methods.

(5) The acceptance of price leadership operates in a very similar manner altho it may be accompanied by excessive investment in the industry: the outcome of its operation, once established, depends mainly upon the extent of the leader's power to coerce and his attitude to the desirable price and production policy.

The analysis of the effects of these various methods of concentration has treated of each method operating alone, a device which permits simplicity of exposition. In fact, however, two or more methods often appear in use either simultaneously or in succession. Price cutting is combined with sales promotion expenditure, when advertising centres around a price cut made by an innovating firm, hoping thus to shorten the period and, therefore, reduce the cost of concentration. Price cutting may be resorted to not so much as a means of directly effecting concentration, as to prepare the way for other methods. A period of price cutting may make mergers possible upon a basis much more favorable to the firm absorbing others than if the firms to be absorbed had not been brought face to face with the losses resulting from price cutting. And mergers may be used to prepare the way for price and output agreements or to induce price leader-

ship. Price cutting or sales campaigns may prepare the way for a merger which in turn prepares the way for price leadership. The use of one method of concentration may also condition the type of response to stimuli to concentration in succeeding periods of time. Price agreements obstruct price cutting and, possibly, mergers.

III

THE PROBLEM OF SOCIAL CONTROL

Altho social control of industrial concentration has seemed from time to time to turn upon the formal clothing of the changes in control, it now rests ultimately upon the forces motivating the changes. No form of concentration is unconditionally proscribed or accepted.

Price competition is deemed so desirable that antitrust legislation is aimed principally at its preservation and courts from time to time portray its beneficent tendencies. Nevertheless the federal² and most state legislatures prohibit some forms of price cutting involving discrimination, and the courts condemn price competition indicative of intention to monopolize.³ Expenditure upon sales pressure is nowhere prohibited by legislation and while generally accepted by the courts,⁴ it is condemned when it is believed to be impelled by wrong motives.

The increasing importance of the merger as a means of concentration has attracted the attention of Congress and resulted in the specific prohibition in the Clayton Act of concentration of control over two or more corporations through the use of a holding company or through interlocking stockholding, wherever these arrangements would substantially lessen competition between the corporations concerned or "restrain commerce in any section or community or tend

2. Clayton Act, 1914, Section 2.

3. Cf. *Standard Oil Co. of New Jersey et al. v. U. S.*, 221 U. S. 1, U. S. v. *American Tobacco Company*, 221 U. S. 106, U. S. v. *Corn Products Refining Company*, 234 Fed. 977.

4. *U. S. v. Quaker Oats Company*, 232 Fed. 506; *U. S. v. American Tobacco Company*, 221 U. S. 106; *Federal Trade Commission v. Gratz*, 253 U. S. 421.

to create a monopoly of any line of commerce." To any ordinary reader the act appears to prohibit mergers altogether except where the corporations affected are engaged in different lines of production (i.e., where the integration of different industrial activities is secured) or where rival businesses are acquired for cash. Judicial interpretation has, however, narrowed the application of the act. Prior to the Clayton Act the courts had decided that the prohibition in the Sherman Law of trusts and all other devices restraining trade or creating monopolies applied to the holding company⁵ and to interlocking stockholding⁶ where they restrained trade or created a monopoly. Subsequent interpretation of these provisions of the Clayton Act has limited them practically to mergers which would have been condemned under the Sherman Law.⁷ Narrow definitions of the market have made it possible to argue that the merging firms did not previously compete at all or competed only on an unsubstantial scale. Mergers between bottle manufacturing companies making bottles for different uses, shoe manufacturing companies one of which sold in large towns and the other in small towns, coal mining companies selling through different wholesalers have all been thus brought within the law.⁸ Furthermore, if these devices be resorted to and used to consolidate the corporations into one before the Federal Commission takes action the Commission is powerless to attack the merger.⁹

In the course of the interpretation of the Sherman Law, however, there have been occasions when the Supreme Court has been inclined to regard resort to merging as a method of

5. *Northern Securities Company v. U. S.*, 193 U. S. 197 (1904); *U. S. v. American Tobacco Company*, 221 U. S. 106 (1911); *Standard Oil Company of New Jersey v. U. S.*, 221 U. S. 1 (1911).

6. *U. S. v. Union Pacific Railroad*, 226 U. S. 61 (1912).

7. *Standard Oil Co. v. F. T. C.*, 282 Fed. 87.

8. *Federal Trade Commission v. Thatcher Manufacturing Company*, 5 Fed. (2d) 615 (1925), 272 U. S. 554 (1926); *Federal Trade Commission v. International Shoe Company*, 280 U. S. 291 (1930); *Federal Trade Commission v. Temple Anthracite Company*, 51 Fed. (2d Series) 656 (1931).

9. *Thatcher Manufacturing Company v. Federal Trade Commission*, 272 U. S. 554 (1926).

concentration as itself evidence of a wrongful motive. It has contrasted "normal growth to meet the demands of a business growing as a result of superior and enterprising management" with "deliberate and calculated purchase for control,"¹ and has commented upon the acquisition of a number of companies as giving rise to the "*prima facie* presumption of intent and purpose to maintain the dominance over the oil industry, not as a result of normal methods of industrial development, but by new means of combination which were resorted to in order that greater power might be added than otherwise would have arisen had normal methods been followed."² But in recent years this unfavorable attitude to the merger as a form of concentration has disappeared. The failure of the government prosecutions of such large firms arising out of mergers as the United Shoe Machinery Company, the United States Steel Corporation and the International Harvester Company, which is sometimes cited as evidence of a change in the attitude of the courts towards mergers, is, however, not adequate proof of such a change. The long period that elapsed between each of these mergers and the commencement of proceedings suggested, reasonably enough, that the criterion of motivation might more appropriately be applied to the subsequent action of the consolidated firms, altho it was not always applied with rigor. Control of mergers appears in fact to have largely passed to the Attorney General who has in recent years invited interested parties to submit proposed mergers to him. The complete secrecy in which the Attorney General decides whether to discourage merger plans prevents any analysis of his policy. In general, however, mergers, like price cutting and sales campaigns, are judged by the courts by reference to their motivation.

Price and output agreements are generally condemned by the courts irrespective of intent or consequences. The general condemnation of such agreements appears, however, to

1. U. S. v. Reading Company et al., 253 U. S. 26, 57 (1920).

2. Standard Oil Company of New Jersey et al., 221 U. S. 1 (1911). See also U. S. v. International Harvester Company, 214 Fed. 987 (1914).

rest upon the belief that "the aim and result of every price fixing agreement if effective, is the elimination of one form of competition"³ altho the Supreme Court regarded such agreements in the steel industry as evidence of lack of power on the part of the United States Steel Corporation alone to dominate the industry rather than of a wrongful motive to acquire that power by any means available.⁴ Congress has, however, in the Shipping Act, 1916 and the Merchant Marine Act, 1920, withdrawn the shipping and marine insurance industries from the prohibition upon price agreements.

Faced with the question whether a firm shall be permitted to acquire a position in an industry such that its rivals accept its lead in the matter of price, the Supreme Court decided that "the fact that competitors may see fit in the exercise of their own judgment to follow the prices of another manufacturer, does not establish any suppression of competition or show any sinister domination"⁵ and in an earlier case that "the law does not compel competition."⁶ The question whether the attainment of such a position was sought with the object of exercising the power it was expected to give, a question to which the logic of the court itself leads, has never been explicitly discussed. Rather the court appears to feel that acceptance of its lead by others involves no action by the large firm, and, therefore, no question of motivation. But the judicial attitude to price leadership is doubtless also influenced by despair of discovering any practicable means of dealing with it. "Defendants cannot be ordered to compete, but they can properly be forbidden to give directions or make agreements not to compete."⁷

3. *U. S. v. Trenton Potteries Company et al.*, 273 U. S. 392 (1927). The different attitudes of the courts to concentration by merger and by price agreement have also been attributed to the difficulty of dissolving a large corporation without injury to the public interest and the ease with which adherence to price and output agreements can be forbidden (*U. S. v. Appalachian Coals Inc.*, Advance Report United States Daily, October 6, 1932).

4. *U. S. v. U. S. Steel Corporation*, 251 U. S. 417 (1920).

5. *U. S. v. International Harvester Company*, 274 U. S. 693 (1927).

6. *U. S. v. U. S. Steel Corporation*, 251 U. S. 417.

7. *Swift and Co. v. U. S.*, 196 U. S. 400.

This policy of controlling concentration by reference to the motivating forces behind it has great superficial attractions. It seeks to encourage concentration arising out of the desire to improve methods of production but to discourage it where it is aimed at acquiring control of prices. But it is not a practicable policy. In the first place, it is frequently impossible to infer motives from conduct with any degree of certainty. No doubt a policy of seeking the assistance of economists in the interpretation of the often highly technical data presented to the courts would have rendered the decisions more consistent and enlightening. The court has, however, shown a marked distaste for technical evidence, rejecting both the individual economist⁸ and the Federal Trade Commission.⁹ Even technical assistance, however, cannot make the criterion of motivation a practicable basis for social control. Where a firm attains a size large in relation to the whole industry it is often impossible to decide whether it was motivated by the desire to use the most economical methods of production or to attain a position of leadership.

In the second place, reliance upon motivation lands the courts on the horns of a dilemma. Concentration of control aimed at the adoption of more economical methods of production may evidence the operation in the past of motives consistent with competition, but it may give rise to situations in which behavior remotely resembling the competitive is impossible. Even granting that the United States Steel Corporation, the International Harvester Company, the Corn Products Refining Company have attained their size incidentally to the pursuit of economies of production, some measure of price leadership is an unavoidable result of that size. In other words, the new situation gives scope for motives (of price control) that may not have operated before. The motives behind the exercise of the powers of leadership now call for examination if motivation is to be the basis of social control. When registering its decision that "the law does not make mere size an offense" the Supreme Court added

8. *U. S. v. United States Steel Corporation*, 251 U. S. 217 (1920).

9. *U. S. v. International Harvester Company*, 274 U. S. 703.

that it "requires overt acts and trusts to its prohibition of them and its power to repress or punish them."¹ The "overt act" upon which a leader relies is the fixing of prices at a level above that to which they might fall if price cutting were permitted. But the court itself has consistently avoided consideration of prices² and turned scornfully away from evidence of unusual stability in the price of steel rails.³ Furthermore, refusal to accept the pleas of attorneys general that the formation of units so large that they must dominate the industry is itself illegal and that the exercise of the resulting power is merely an aggravation of the offense,⁴ and insistence upon "overt acts," combined with an acute sensitiveness to the difficulties of partitioning large corporations once they have been formed⁵ makes an easy path for the large corporation round the anti-trust laws.

In the third place, where no corporation sufficiently large to enforce leadership exists, but the facilities for production are so great that the full output can be sold only at a price that will fail to yield a normal return, price competition may impose a long period of returns below, perhaps far below, normal. Discouragement of price and output agreements on the ground that they are a means to price control tends to encourage mergers aimed at price leadership or informal conventions concerning prices (which often result in great rigidity of prices). In the long run fear of cut-throat price cutting is likely to induce resort to some means of avoiding free competitive behavior.

The policy of the courts fails, therefore, to obstruct very seriously the strong trend away from price competition, altho their policy rests upon the advantages of competition in fairly perfect markets. They are merely diverting the trend

1. *U. S. v. U. S. Steel Corporation*, 251 U. S. 417.

2. *U. S. v. Trenton Potteries Company*, 273 U. S. 392.

3. *U. S. v. U. S. Steel Corporation*, 251 U. S. 417.

4. *U. S. v. U. S. Steel Corporation*. Brief for U. S. (Reargument) (1916) 88 and 251 U. S. 450, *U. S. v. American Can Company*. Brief for U. S. 57, *U. S. v. Reading Company*, 1920. Brief for the U. S. 81.

5. *U. S. v. U. S. Steel Corporation*, 251 U. S. 417, *U. S. v. American Can Company*, 230 Fed. 859, *U. S. v. Appalachian Coals, Inc.* Advance Report United States Daily, October 6, 1932.

in the direction of price leadership where it is uncondemned and uncontrolled.

What policy then is most to be commended? The foregoing analysis suggests that each method of concentration has advantages and disadvantages, and that those most suited to facilitate improvements in productive technique also facilitate concentration aimed at price control. The acceptance of some methods and prohibition of others would, therefore, be unsatisfactory, and it would be practically impossible to proscribe expenditure upon sales campaigns or prohibit price leadership. No satisfactory policy can therefore be based upon the *method* of concentration, and the experience of the courts indicates the impossibility of a satisfactory control by reference to the motive of concentration.

There remains the possibility of control by reference to the probable consequences, immediate and ultimate, of each concentration. The principal immediate consequence of importance is the effect of an increased concentration upon the probability that firms will act "competitively," i.e., that they will in framing their policies take no account of the effect of changes in their output upon prices and upon the policies of rivals. A control which avoided such situations (having overcome the serious practical and theoretical difficulties it involves) would eliminate price leadership. But in doing so it would in some industries (e.g., steel, anthracite, oil) seriously obstruct the utilization of knowledge concerning the most economical scale of production. And to do so it must overcome a strong contemporary bias in favor of pursuing economies of production without full consideration of incidental consequences which contemporary social institutions and accounting conventions fail to translate into money costs.

Social control based upon the ultimate consequences of concentration has the great advantage of removing such obstacles to clarity of thought as "intent" and "free competition." It directs attention to the problem of discovering criteria by which ultimate consequences are to be judged. Analysis of the type attempted in this paper suggests an

approach to the discovery of the consequences of various methods of concentration. Beyond the identification of consequences, however, lies the more difficult task of distinguishing the desirable consequences from the undesirable. In the last resort decisions must be made concerning the desirable distribution of the benefits and burdens of production. Prohibition of monopoly profits rests upon such a decision. But the imperfections of many markets and the widening pervasiveness of elements of monopoly, together with the acceleration of economic change, are bringing into increasing prominence the necessity for consideration of the proper distribution of the benefits and burdens of economic change. In particular, decisions are needed as to the proper distribution between promoters, innovators, other firms, purchasers and workers of the gains and losses resulting from the adoption of new methods of production, the proper distribution of gains and losses resulting from unanticipated changes in the direction of consumer demand, and the proper distribution over time of supplies of exhaustible natural resources.

Existing social policy permits the concentration of power to deal with these problems in industries where price leadership has emerged. The removal of the prohibition upon price and output agreements would permit such concentration in other industries. But the determination of these broad problems by representatives of one interested group is unwise. And it is hopeless to plead for more drastic laws of the present type, or more enforcement, because of the difficulty of deciding what should be done where the most economical scale of production is so large that few firms can survive. The only reasonable policy is to place the concentrated power over these matters with a body required to make decisions in the open, in full consideration of all the interests involved, and subject to free and informed criticism. Thus the secrecy in which control of mergers is conducted by the attorney general may be avoided. The Supreme Court is itself conscious of its inability to exercise continuing economic control and refuses to determine the ultimate objectives of production.⁶

6. *U. S. v. Trenton Potteries*, 273 U. S. 392 (1927).

A body consciously exercising economic control is needed.

Collective control is capable of directing production so as to eliminate some of the waste of the present system, especially in the matter of the maldistribution of investment. It is also a more suitable means of making the difficult decisions above mentioned concerning the distribution of the gains and losses of economic change. These determinations can be made in view of a wider inclusion of consequences than is involved in commercial bookkeeping and with a wider field of production in view. While in all such decisions probable economic reactions would inevitably play a considerable part, there would remain a very significant residue of choices of a non-economic character involving valuations of consequences to different groups. Such control also provides a better organization for making policy in fields in which adequate past experience is lacking. The prevention of excessive investment turns upon the estimation of future demand over considerable periods of time and, to some extent, of probable future changes in methods of production. The determination of prices depends in part upon estimates of the probable elasticity of demand. In these matters collective decision if not proven by events to be wise would at least be less open to the charge of interested bias than decisions by the representatives of owners or managers.

Legal obstacles there are, but if the need for change is widely enough recognized they are not insuperable. The greatest difficulties lie in the suspicion of state control which is being deliberately fostered (and is an important constituent of the policy of the Supreme Court) and the now well-developed technique for weakening the instruments of state control where they are set up. The chances of honest, competent, and effective control are thereby very greatly diminished.

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UNEMPLOYMENT RESERVES: SOME QUESTIONS OF PRINCIPLE

SUMMARY

I. The incidence of contributions from employers, 313.—Qualifications: unemployment benefits may modify competition for employment, 314; strengthening unionism introduces additional uncertainty, 315; the outcome affected by rigidity of money wage rates, 316.—Shifting forward to consumers, 316.—The assumption that employment is a function of labor costs, 317.—The incidence of a limited system of reserves, 318.—The possibility that there is no net cost, 319.—II. Employers' contributions as incentives to stabilize employment, 320.—The argument obscure and weak, 321.—The necessary conditions of additional financial incentives, 322.—Effects would be largely on casual employment, 324.—III. The form of the reserves: insurance or pooling vs. deposit or savings, 325.—Pooled reserves not true insurance, 326.—Contributions to pooled reserves akin to taxes, 330.—Pooled reserves a mixture of relief and insurance, 330, and are as unstable as industry itself, 332.—The ethics and economics of the deposit or savings basis, 333.—Conclusions, 335.

The scope of this paper has been limited to the economic theory of unemployment reserves, in order to deal exclusively with those problems of analysis where the economists' specialist logic is peculiarly appropriate. The importance of other parts of the problem is not to be minimized; the trend of political events and opinions, the ideals of justice and fairness, administrative expedients in their legal and technical aspects, all must be considered in forming a final judgment. There is at least some truth in the claim that we should consider the logic of events rather than the logic of academic theory. However, even when we face the insistent demand that something be done at once, we remember the after-effects of the emergency expedients adopted in the past. There is still need for the economists' specialist technique in formulating those questions of principle which must be faced squarely. There is still need, in other words, to look beyond the obvious and to consider those long-run influences so belittled by the adherents of myopic economics. The purpose of theoretical

analysis is not to raise artificial issues but to clarify those speculative questions which we encounter inevitably when facts are ambiguous.

I

A leading problem, one which will merit careful analysis, is that of the incidence of the contributions levied upon the employers. There seems to be little question that contributions from the wage-earners are paid by them. The incidence of contributions from the employers is apparently more obscure, for all possible views are represented: some claim the burden is shifted back to the wage-earners, others that it is not shifted at all, and still others that it is shifted forward to the consumers. Some writers are even ready to dismiss the subject with the burden left on "industry" without indicating which party in industry pays the bill.

Several economists have made use of the argument that wages are inadequate and that therefore contributions should be levied upon the employers. This argument appears in a subcommittee report of the Pennsylvania commission,¹ in the experts' testimony before the governors' conference in Albany,² in Douglas and Director's book,³ in the report of the economist of the Massachusetts commission,⁴ and in the report of the Interstate Commission.⁵ On the other hand, economists who have made a theoretical analysis of the problem have reached, with practical unanimity, the conclusion that the burden is shifted to the wage-earners⁶ or that the ultimate incidence of the burden is the same whether the con-

1. Report, *Alleviating Unemployment* (Harrisburg, 1931), p. 27.

2. *Proceedings* (Albany, 1931), pp. 45, 48.

3. *The Problem of Unemployment*, Macmillan (New York, 1931), p. 485.

4. *Final Report of Commission* (Boston, 1933), pp. 103-110.

5. Mimeographed report, p. 2. Printed as Appendix V, *Report of Connecticut Unemployment Commission* (1932), p. 160.

6. Taussig, F.W. *Principles of Economics*, 3d rev. ed. Macmillan (New York, 1921), II, pp. 355-356. Brown, H. G. *The Economics of Taxation* (New York, 1924), chap. VI. Yoder, D. "Some Economic Implications of Unemployment Insurance," *Quarterly Journal of Economics*, XLV (August, 1931). Cohen, J. L. "The Incidence of the Costs of Social Insurance," *International Labour Review*, XX (December, 1929).

tributions are levied upon the employers or the wage-earners.⁷ While there is but little to be added to the statements already made by other theorists, a restatement of the theory that the burden is shifted to the wage-earners is worthwhile in view of the importance of the question.

The contributions levied upon the employer are proportionate either to his pay roll or to his work force. In either case they amount to a compulsory increase in his wage payments. In every business decision, whether on hiring more or less labor or substituting slightly different methods of production, the employer will be confronted with the fact that labor is more expensive. He will economize on the relatively expensive method of production. The contributions to unemployment reserves are not analogous to a commodity tax, because the tax is the same whatever be the method of production: its amount is not tied to the labor factor. This difference between social insurance premiums and taxes is recognized in the practice of cost accounting, for the overhead burden of insurance premiums is distributed among departments in proportion to their pay rolls.⁸ As the scales are weighted against labor, wages will be reduced by competition for employment, or the opportunities for increases in wages will be reduced.

This general statement would apply to any form of social insurance. Unemployment reserves present some peculiarities. Downward pressure on wage rates comes in general from the competition for employment among the unemployed; and other forms of social insurance, say workmen's compensation, leave unaffected the competition for employment. But unemployment benefits reduce the pressure on wage rates from the competition of the unemployed. If the public treasury aids in unemployment relief, this pressure is still more reduced. The outcome is not fully determinate. We can say that economizing on the relatively expensive factor will either reduce wage rates or will increase unemployment, but we cannot say

7. Pigou, A. C. *Industrial Fluctuations*. Macmillan (London, 1927), pp. 346, 347 n. 1.

8. Jordan, J. P. and Harris, G. L. *Cost Accounting, Principles and Practice*. 2d ed. New York, Ronald (1925), p. 267. Sanders, T. H. *Industrial Accounting*, New York, McGraw-Hill (1929), p. 126.

which. Dr. Joseph L. Cohen says, to be sure, that a condition where unemployment benefits offset the pressure to lower wages "clearly is not likely to last very long."⁹ I am far from sure that the experience with unemployment benefits justifies the use of Dr. Cohen's view as a premise of theoretical analysis. A definite acceptance or rejection of the view would make the outcome determinate: we could safely reach the conclusion that wage rates will or will not be reduced.

Reaching a definite conclusion is made more difficult by the probable effect of a compulsory system of unemployment reserves upon trade unionism. Trade unionism will probably be strengthened by such a system. Organized labor can strengthen its position (1) by representation in the administration of the system and (2) by representation of individual claimants in disputed cases. It will be strengthened also (3) by the reduced pressure on the unemployed to act as strike-breakers and (4) by the reduced pressure on union standards of wages. To the extent that unionism is strengthened, we approach a condition of "bilateral monopoly," "a situation where one set of persons bargains as a body with another set, each set in an equally strong position and each untroubled by outsiders." "As a matter of 'straight economics,'" we are told by Professor Taussig, "... the outcome is indeterminate."¹ Some of the uncertainty is brought about, here again, by the absence of any reasonable assumption of the proportion between wage-earners employed and unemployed. The strengthening of the unions brings also uncertainty on another point. When accompanied by a growth of employers' associations, which modify the competition for labor, wage rates are no longer determinate even if the number of laborers available for employment is a fixed quantity. The assumption that a strengthening of unionism will be accompanied by a strengthening of employers' associations is not always made in discus-

9. "The Incidence of the Costs of Social Insurance," *International Labour Review*, XX (December, 1929), p. 822.

1. Review of Frankfurter and Green's *Labor Injunction*, *Quarterly Journal of Economics*, XLIV (August, 1930), p. 685. Cf. Zeuthen, *Frederik: Problems of Monopoly and Economic Warfare*. London, Routledge (1930).

sions of the effects of substituting collective for individual bargaining. It is amply justified by experience, however, and leads to the significant question of the comparative addition to bargaining strength obtained by each side. The strengthening of unions thus increases the uncertainty on one point, and adds another point of uncertainty. The effect of the employers' contributions upon wage rates is thus rendered more uncertain by the strengthening of unionism.

The outcome of the pressure on wage rates is affected somewhat by rigidity or inertia. The economic theorist commonly means by a reduction of wage rates either an actual reduction of money wage rates or an actual rise smaller than would otherwise take place. This may do well enough for those who think habitually in theoretical terms, but it is most misleading to the outsiders who think that a reduction of wage rates means in theory what it means in English. Some of the misunderstanding comes from the practical man's desire for straightforward, unconditional prediction, a desire which theory can never satisfy; but some of it comes from the practical man's belief that the theorist, for all his love of logical distinctions, has overlooked one of great significance. Without exploring the whole area of the effects of custom upon prices and wages, we must take in account the notorious inflexibility of money wage rates. If the other factors affecting wage rates are working in an upward direction, it is highly probable that the downward pressure of reserve contributions will be easily absorbed and will not result in more unemployment. If, on the contrary, the other factors are not working in that direction, if wage rates can only be affected by an actual reduction, the effects upon unionism will be different and unemployment is more likely to be increased.

An entirely different theory of the incidence of the employers' contribution is contained in the common assertion that the burden is shifted to the consumers in the form of higher prices. This view is sometimes expressed or at least implied by academic economists² and, more often, by other friends of

2. Douglas and Director say "it is only proper that industry and the consumers should pay part of the burden." *Op cit.*, p. 494. Cf. Pro-

unemployment reserves.³ The opinion that employers' contributions, if general throughout industry, will result in a rise in the general level of prices is entirely unsupported by the economists' theory of that subject. On some such matters the differences among theorists are notorious, but on this particular topic there is unanimity. Cost of production plays an important part in many theories of value, but there it is exchange value that is under examination. It is relative prices and relative cost of production that are being considered; the assumption that the general price level is constant is there so important that as a rule it is explicitly stated.

It is, of course, true that "no one familiar with factory cost account will question . . . that insurance costs of this character . . . will be added to overhead and through overhead will appear as part of the cost of the finished product."⁴ But it does not follow that this cost is a permanent net addition to total cost and to selling price. If the consumers will curtail purchases when price is advanced, the other elements of cost will have to make room for insurance costs.

The foregoing discussion rests upon an assumption which should be stated explicitly: it is not true as a general and universal proposition that labor costs and wage rates can be increased without increasing unemployment. This assumption implies no commitment to any theorist's wage doctrine, for the belief that there are upward limits to wage rates is common to them all. Many statements of the economic theory of trade unionism would leave the reader with the impression that in unorganized trades wage rates are always below the maximum compatible with full employment. Such statements commonly run in "real" terms and discuss the

ceedings of Inter-State Conference, p. 96. Groves, H. M. Unemployment Compensation, *Industrial Relations*, III (August, 1932), p. 380.

3. Fitch, J. A. "Who Should Pay the Cost of Unemployment Reserves?" *American Labor Legislation Review*, XXII (March, 1931), p. 43. Swope, Gerard. *The Swope Plan* (J. G. Frederick, ed.), New York, Business Bureau (1931), p. 44.

4. Leeds, M. C. "Comments on Dr. Witte's Theory of Compensation Costs," *American Labor Legislation Review*, XX (December, 1930), p. 419.

wage-earners' bargaining weaknesses which arise out of such factors as immobility, perishability, and lack of reserve funds. They sometimes ignore the inflexibility of money wage rates and sometimes assume that the inflexibility is purely a resistance to the upward pressure occasioned by a greater demand for labor. Our assumption runs counter to such statements of the theory of unionism. Their weakness lies in the failure to recognize that money wage rates are resistant to downward pressure also and that in some periods the resistance to such pressure may be of greater importance than all the wage-earners' weakness in bargaining. Whatever might be true in periods when the trend of prices is upward, we cannot ignore Professor Schumpeter's conclusion as to a period like the present: "The causes are different in different countries but everywhere wages are higher than is compatible with full employment."⁵ Our assumption is not one which would hold good only in a static state; it is not barren of significance for contemporary problems.

The foregoing discussion of the incidence of employers' contributions has been limited to the case of universal compulsory reserves. If the system is not universal, but limited to companies, industries, or states, the incidence problem changes somewhat. Following the analogy of a tax on a single commodity, it may be argued that the result will be a rise in the price of the commodity concerned. An important difference exists, however; the proceeds of a commodity tax ordinarily are not expended for the benefit of those taxed, whereas the unemployment contributions go for benefits. If the benefits are evaluated by the workmen at their cost, there is no reason why the total cost should be increased and prices rise. A tax is shifted forward through the process of the producers shifting away from the taxed employment. If the benefits are evaluated at cost, there is no reason why the

5. Schumpeter, Josef. "The Present World Depression: A Tentative Diagnosis," *The American Economic Review*, XXI, Supplement (March, 1931), p. 181.

wage-earners should shift; and if they do not, there is no reason why the other factors of production should move.⁶

That workmen may evaluate the benefits at their cost is a possibility generally overlooked.⁷ Implicitly it has been denied by economists and by men of affairs. Writers on company plans hold that unemployment reserves will be an addition to total costs. This is often made part of the argument for compulsion: it is stated that company plans cannot expand because the addition to costs is a handicap in competition.⁸ Without discussing the general merits of compulsion, it seems too early to commit ourselves definitely to the view that the wage-earners will not evaluate the benefits at their cost. True, experience may prove that the view is correct. If it does so, the analogy of reserves for unemployment with reserves for investors breaks down. Individual corporations have found their hold upon investors strengthened by providing reserves for dull periods; the investors have given tacit consent to systems of deferred compensation. If the technical problems of convenience, certainty, and economy can be worked out, there is no *a priori* reason why the wage-earners should not make present sacrifices for future benefits.

No discussion of incidence would be complete without some reference to the possibility that there is no net cost. It may

6. Cf. Brown, H. G. *The Economics of Taxation*, New York, Henry Holt & Co. (1924), pp. 164-165. According to Professor Brown, the burden of insurance contributions in a particular industry where the benefits are not valued by the wage-earners is upon all wage-earners. Altho he admits that the price of the particular product will rise, he points out that the shifting of labor away from the industry will lower the general level of wages. (Op. cit., pp. 170ff.) This argument overlooks the fact that if labor alone shifted, the optimum proportions between the factors would be lost. Labor will not shift alone; all other factors will shift, except in the special case where the natural resources can be devoted to no other use. In so far as the shift involves a lower rate of return, all factors suffer alike. Moreover, even when the amount of shifting is large in relation to the total factors employed in producing the commodity, it is extremely small in relation to the total factors employed elsewhere. For this reason, economists commonly consider insignificant the influence Professor Brown points out.

7. Professor Brown's suggestion has been ignored by later writers.

8. Stewart, B. *Proceedings of the Governors' Conference on Unemployment* (Albany, 1931), p. 57; Douglas and Director, op. cit., p. 490.

be argued that the conservation of human resources will pay for itself, that the employers will be ready to pay higher wages for more capable workmen. Whatever may be our hopes for the future and whatever might be possible under better systems than those tried up to now, experience to date demands that our reasoning consider reserves a device to spread income through time, not to increase it. Many economists have argued that spreading income through time will stabilize purchasing power and employment; but this argument would take us so far into questions of central bank policy and business cycle theory that it could not be discussed adequately except in a separate article. My own conclusions on the topic do not lead me to treat the burden of unemployment reserves as an illusion.

The analysis of the incidence problem leads to two important conclusions. The advantages of contributions from employers and wage-earners respectively are questions of political and administrative expediency. The justice of asking the wage-earners to bear the burden of their own unemployment has no bearing on this question. If it is considered just or desirable to shift the burden to other shoulders, this can be done by putting some of the burden on the public treasury, unless — an important condition — the possibilities of progressive taxation have already been exhausted.

II

The argument that employers' contributions to unemployment reserves will give them an incentive to stabilize employment is found so frequently in the American literature that its analysis ought to be easy. As a matter of fact, it is not; for the argument is rarely elaborated, but simply repeated over and over again like an article of faith. Sometimes it appears linked with the view that the employer's contributions come out of his own pocket. This view is erroneous, but it is at least clear. But what are we to say of arguments that the employer has an incentive to reduce his burden and has no burden because he shifts it? Each argument weakens the other. If we accept the view that the burden is entirely

shifted, wage rates (or prices) are so readjusted that the employer's position is unchanged. If the employer is fined five dollars every time he lets a man go and if every man deposits five dollars with his employer against that contingency, the employer will hire and fire as before.

The faith in reserve contributions as incentives is sometimes expressed so strongly that we can infer a belief that the incentives will aid materially in doing away with unemployment. It is difficult to share this confidence, because it is obvious that idle labor means idle equipment and that periods of unemployment are periods of business losses. Industrial irregularity would appear to be caused not by lack of incentive, but by lack of knowledge and lack of control of factors and forces external to the individual establishment. This counter argument is not new, but it has never been effectively answered by the incentive school.

One answer, that of Professor H. Feldman,⁹ shifts the discussion from financial rewards and pecuniary calculations to psychology. "The psychological advantage of unemployment compensation," he says, "is that it involves a definite, tangible, money payment while the losses of irregular operation are hard to estimate and are intangible." On the contrary: the accountants have already developed devices, such as idle-time allowances, unabsorbed burden, and profit and loss statements which bring these losses to the attention of the controlling executives.

The outsider's difficulty in understanding the incentive school is not diminished when one of its leaders goes on to point out "the advantages to employers of stabilizing employment."¹ At the present time, the incentive theory has led in the Wisconsin Act to attempts to make each employer responsible for his own unemployment. At an earlier stage in the development of the theory, it was recognized that the causes of unemployment were largely beyond the control of

9. *The Regularization of Employment*. Harper, New York, 1925, pp. 366-367.

1. Commons, J. R. *American Labor Legislation Review*, XII (1922), p. 24.

the individual employer and the incentives were to be given business leaders as a class. In 1921, Professor Commons declared: "More important than the employer is the banker as the stabilizer of employment."² Even if this be admitted, it does not follow that what the bankers now lack is incentives rather than knowledge and control.

Economists will have to avoid the trap, against which theorists have so often been warned, of thinking solely in terms of pecuniary calculations. If the economists, working through the legislatures, seek to condition the employers' thinking, the employers may turn upon the "conditioner." Far from accepting with docility the guidance of the economists, the employers' reaction may be resentment of an outrageous libel. To many employers, the assertion they could do away with unemployment, if they only would, is nothing short of an insult. To them, it is as baseless as accusing the butcher, the baker, and the grocer of responsibility for undernourishment.

The additional financial incentive to stabilize employment depends, first, on the technical form of contribution and, secondly, upon the likelihood that the peculiar technical form will be adopted. The form of contribution, if it is to add to the incentives, must amount to a practical prohibition of casual labor. If the employer were fined a substantial sum whenever he let a workman go, he would not hire anyone for a short period; and no workman would take the risk off his hands. If the fine was to be paid over to the workman, not to the state treasury, the workman, if he had the money, would be ready to take over the employer's burden in order to get a job, for he would be running no risk. The form of contribution, to be an effective prohibition of casual labor, has to make the burden on the employer so great that the workman would rather refuse the job than accept the burden. If the employer's contributions and liabilities are proportional to the period for which he has employed the workman, there is no effective prohibition of casual labor. These burdens can be shifted by

2. Unemployment Compensation and Prevention, Survey (October 15 1921), p. 6.

changes in wage rates. A further and obvious technical requirement is that the employer's liability should be limited to benefits for workmen whom *he* has dismissed.

Next what is to be said as to the likelihood that the needed technical forms will in fact be adopted? Prohibition of casual labor appears improbable. Even the Wisconsin Act, a product of the incentive school, does not contain it; contributions and liabilities are proportionate to the period of employment. The provision that the contributions shall not be shifted to the wage-earners is a curiosity of legislation; clearly, it cannot prevent shifting through changes in wage rates. It can only prohibit "contracting out."

That the employer's liability should be restricted to "his own" workmen is a declared principle of the incentive school. The widespread adoption of the principle appears improbable. It demands that the employer's liability be restricted not only to his own workmen, but further to those of his workmen who have been dismissed for lack of work. Under this principle, the employer should have no liability toward any workman who quits him voluntarily and who later is without work. The principle demands, in other words, that the workman who voluntarily transfers from one employer to another should be unable to transfer his claims on the reserve.

The principle of non-transferability is clearly incompatible with the other principle that workmen who quit individually or collectively should preserve their claims to unemployment benefits. A law of "industrial settlement" by which only regular employees have claims and moving extinguishes claims is a harsher enactment than the old law of settlement. The principle of restricting the employer's liability to his own employees makes the employer lord of an industrial manor, on which labor is a fixed charge. It conflicts with the unrestricted mobility of labor. It runs counter to all those sentiments summed up by Professor Commons in the statement: "Liberty means labor turnover: it means that the worker can quit one job and go to another."³ Restrictions upon the

3. Unemployment Compensation and Prevention, Survey, October 1, 1921, p. 5.

workman's mobility are commonly a basis of attack on most of the company plans for unemployment reserves.⁴ Industrial feudalism made compulsory by legislation is never welcomed. The objection to the employer regarding any group of workmen as "his own" is so strong that he will probably not be given an additional incentive to control "his own" by shielding them from unemployment. Unfortunately for the analogy with accident prevention and compensation, unemployment reserves require accumulations in advance and thus necessarily raise the mobility problem.

As both the technical requirements for additional incentives will probably not be acceptable, hope for the reduction of unemployment must rest on other grounds. At best, the incentives would work, as has already been intimated, largely for the reduction of casual unemployment. Seasonal unemployment might be affected somewhat — not easy to say how much — the most serious forms of unemployment, technological and cyclical, practically not at all. Technological unemployment is usually accompanied by some cost to the employers initiating the change in production methods. So far as employers are ready to incur the costs of scrapping old equipment, the additional costs involved in small benefits of short duration to dismissed workmen will rarely change the balance to the disadvantage of a new process, especially when the new process promises a reduction of such liabilities for the future.

So far as cyclical unemployment is concerned, it might appear that putting labor costs in overhead would so reduce the direct expenses that it would add to the employer's readiness to cut prices in times of depression. But prices are not regularly cut to out-of-pocket expenses; where manufacturers have control over price, their doubts about the capacity of the market and their fears of retaliation from competitors count far more than the precise amount of the out-of-pocket

4. This criticism does not come only from outsiders. Thus Mr. Gerard Swope, in presenting his plan, points out: "Benefits earned by a worker in one employment are wholly or in large measure lost by forced changes; or the right of choice of employment, which should be inalienable, is hampered." *The Swope Plan* (J. G. Frederick, ed.), p. 30.

expenses. The higher the fixed charges, the more the employers think about them, and the less they consider out-of-pocket expenses alone. For all these reasons it is difficult to share Professor Carter Goodrich's opinion that "there is a considerable group of employers who find their present calculations rather closely balanced between the gains of more regular operation and the tempting savings of pay roll cuts."⁵

The outcome of this discussion of the incentive school may be summed up in three propositions. Its members grossly underestimate the strength of existing incentives. They overlook the intimate connection between incentives and incidence. They do not face the technical difficulties in carrying an incentive plan through. These basic difficulties stand in the way of the attractive proposal to force the employer to pay in proportion to his unemployment, not his employment.

III

We turn now to the form of the reserve itself. Most commonly, the reserve is constructed on a pool basis; and unemployment reserves and unemployment insurance are thought of as synonyms. In very recent American discussions, the term reserves seems to be preferred to the term insurance.⁶ This change in words arises in part from a desire to disown British and German experience, but in part from some doubts on the validity of the insurance principle. In particular, the incentive school has gone far toward rejecting the insurance principle. The Wisconsin Act, with its separate account for each employer, even by one with ten workmen, and its prohibition of reinsurance, has carried out the teachings of the incentive school. None the less, each account is a pool for the benefit of the workmen concerned; Professor Commons goes too far when he says "there is no 'insurance' or common fund at all."⁷

5. American Plans for State Unemployment Insurance. *American Economic Review*, XXI (September, 1931), p. 413.

6. Professor Commons speaks of "the mistake of failing to distinguish Unemployment Reserves from Unemployment Insurance." *American Labor Legislation Review*, XX (September, 1930), pp. 266-267.

7. The Groves Unemployment Reserve Law, *American Labor Legis-*

That the pool basis is not the only one possible should be clear from the corporation reserves, to which reference is made so frequently. Altho both Professor Commons⁸ and Professor Douglas⁹ have referred to these as insurance, there is no insurance in them. Each stockholder has his proportionate share. When payments are made from them, all stockholders share alike; the more unfortunate do not receive all the benefit and the more fortunate do not pay in and receive nothing. Such reserves are not on a pooled or insurance basis; they are on a deposit or savings basis. Workmen's reserves for periods of unemployment are not necessarily on a pool basis; they also might be constructed on a savings basis. Indeed, we are told by one of the authors of the 1911 British Act, Sir Hubert Llewellyn Smith, that "the deposit idea ran through the original act."¹ It is the pool in the sense of a general reserve, however, which is usually contemplated in the current proposals.

Pooled reserves in a compulsory system cannot meet the technical requirements of insurance. Insurance requires something more than statistics which permit the calculations of the average risk in the past. It requires even something more than a reasonable basis for projecting the average risk into the future. It requires that a specific average risk be calculated for each group of workmen within which the exposure to misfortune is uniform. "To be sound scientifically and fundamentally," says Mr. Frederick H. Ecker, President of the Metropolitan, it "is essential to an insurance plan that . . .

lation Review, XXII (March, 1932), p. 9. Cf. Groves, H. M. Unemployment Compensation, *Industrial Relations*, III (August, 1932), p. 381. See also the Handbook on the Wisconsin Unemployment Compensation Act, published by the Industrial Commission, p. 50: ". . . From the point of view of employes the employer's unified unemployment reserve represents a measure of 'insurance,' and gives more adequate protection than would the employer's contribution if it were split up into individual employe accounts."

8. Unemployment Compensation, *American Labor Legislation Review*, XX (September, 1930), p. 250.

9. Douglas, P. H. and Director, Aaron. *The Problem of Unemployment*, New York, Macmillan, 1931, p. 485.

1. Minutes of Evidence Taken Before the Royal Commission on Unemployment Insurance (1931), p. 1297, q. 10351.

those insured must be placed in homogeneous classes."² It is a complete misunderstanding of insurance to say, as does Dr. J. L. Cohen, that its "very essence is the pooling of good and bad risks."³ When Mr. Abraham Epstein says, "Referring to unemployment insurance, the prosperous industries and the employed workers would help to bear the load of the weaker members,"⁴ he is not talking about insurance.

Even when a state scheme departs from the plan of a single national fund, and sets up separate accounts for geographical districts, industries, trades, or individual employers, the classes are not homogeneous; good and bad risks are lumped together. Trade union unemployment benefits did not pretend to be real insurance. The funds were usually merged in the general treasury; and the regularly employed workmen were ready to pay something to buy up a small amount of surplus labor on the market in order to avoid the supposed consequences of its competition. Some company plans protect a homogeneous class of regular employees against the risk of being laid off temporarily but not let go permanently; but legislation neither could nor would attempt to make such plans universal.

The fundamental difficulty has been well stated by Mr. Henry Moir, ex-president of the Actuarial Society of America: "The question of probabilities being *equally likely* in the case of different people . . . does not seem to lie within the mathematical definition when we deal with unemployment. Occasionally, a thoroughly efficient and intelligent workman is thrown out of a job; generally speaking, such a man soon finds another. On broad general lines, and with allowance for exceptions and exceptional times like the present, the types of men who suffer much from unemployment can be picked out by a good psychologist. It is not a matter of fate or chance striking individuals at random. Workmen could be

2. Is Unemployment Insurable? Proceedings Academy of Political Science, XIV (1932), pp. 27-28.

3. Insurance by Industry Examined. London, P. S. King & Sons (1923), p. 56.

4. Hearings before a Senate Committee on Unemployment Insurance, United States Senate (1932), p. 434.

graded with a considerable degree of accuracy, from those who are rarely unemployed down to those who are nearly always unemployed. This is not in accord with the fundamental definition under the laws of chance."⁵ We cannot overlook the fact that the unemployed are heterogeneous individuals.

This view is not held by professional actuaries only, who might be suspected of being overfastidious about the niceties of their specialist logic. Equally emphatic is Mr. G. D. H. Cole, who writes: "Is the Unemployment Insurance Scheme, has it ever been, and can it ever be, insurance in any ordinarily accepted sense of the term? Under any ordinary system of insurance, the individual insures because he thinks it worth while from his point of view; and the premium charged bears a fairly close relation to the estimated risks of accepting the insurance. In the system of compulsory state insurance against unemployment, neither of these conditions exists . . . The individual, if he falls within the categories laid down by statute, is compelled to insure, whether he wishes to or not; and the contributions which he has to pay bear no close relation to the risks to which he is subject."⁶

A second requirement for insurance is that the misfortune should be so infrequent, and so great when it does occur, that no individual's experience will average out. If small misfortunes are frequent, each individual can provide self-insurance. Tire punctures, for example, are not insurable risks, for, while at any one time they are matters of chance, they occur, during a driver's lifetime, according to the care and the skill he exercises. The same is true of much unemployment. Altho at any one time there is a chance element in

5. Transactions Actuarial Society of America, XXXII, Part One (1931), p. 95.

6. Minutes of Evidence taken before the Royal Commission on Unemployment Insurance (1931), p. 740, para. 19. In his subsequent testimony, Mr. Cole weakened his original statement (para. 6145). Consider also the testimony of Mrs. Sidney Webb: "Personally I doubt whether the unemployment arising out of the modern capitalistic system is an 'insurable risk.'" Minutes, p. 1320, para. 6. Another expression of this Labour viewpoint is the article, Unemployment is Not an Insurable Risk, Hayday, A., *The Labour Magazine*, X, July, 1931.

the distribution of unemployment among individuals, the chance element is much reduced when the man's working life is considered as a whole. This is particularly true of those types of unemployment, seasonal and incidental, for which averages can be calculated with relative ease and assurance. This point comes up in connection with the curious argument of Sir Alfred W. Watson, the British Government Actuary, that "dependent benefit . . . is consistent with the general principles of sound insurance."⁷ If it be true that the number of dependents, while different at any one time, averages out in the course of the wage-earners' lives, the validity of the insurance principle is reduced, because the chance of being unemployed loses much of its chance character when the experience of a whole lifetime is considered.⁸

Averaging in the experience of an individual might occur even tho the misfortune was infrequent and great. But this is unlikely. If it did occur and if the risks could be placed in homogeneous classes, there would be a place for insurance. The averaging is dependent, further, upon the condition that the misfortune is not cumulative. If each misfortune impaired the individual's chance in the future, if he could not recover and compete on even terms with the more fortunate, insurance would have a place. We cannot tell the extent to which the after-effects of unemployment make another period of unemployment more likely. Probably the after-effects are less important in those cases where the averages can be calculated most easily. The averaging in the course of an individual life is least defensible in cyclical and technological

7. Minutes of Evidence (1931), p. 395, para. 3356.

8. Although Sir Alfred "agreed entirely" with Mr. Henry Clay that "any unemployment insurance scheme must be rather a bundle of expedients to make sure that no one takes advantage of the scheme unnecessarily, and limiting the amount of expenditures possible under the scheme, . . . than a scientific cover against a calculable risk such as life insurance gives . . .," (Minutes, para. 3507) the rest of his evidence was dominated by an insurance point of view. He repeated arguments which were entirely logical as insurance theory but which merited Sir William Beveridge's adjectives "strangely academic" (Unemployment (1930), p. 284, n. 2) and "pedantic" (Minutes, p. 727, para. 5892), if the bundle of expedients viewpoint is adopted.

employment; and it is in these types of unemployment that averages cannot be relied upon and homogeneous classes are impossible.

In every "insurance" scheme, the principles of insurance have been departed from by provisions, such as a maximum ratio of benefits to contributions or amount of previous employment, which are based on individual, not group, experience. If unemployment is a matter of chance, it is equally a matter of chance whether one man or another is eligible because of a little more than the necessary amount of employment or because of a little less than the maximum period of insured unemployment.

Several important consequences follow from the proposition that a pooled reserve does not meet the strict technical requirements of insurance. The contributions paid directly or indirectly by the workmen least exposed to unemployment are above the cost of their benefits. We must agree with Mr. G. D. H. Cole when he says: "In the circumstances the contributions paid by or on behalf of employed workers are . . . rather a poll tax on wage-earning . . . and a tax on employment."⁹ If contributions from the public treasury are brought in to reduce the contributions by such a workman to a cost basis, as in the original British Act,¹ we have a mixture of insurance with relief for the workmen in greater need. The relief character is not, however, dependent on the contributions from public funds. If the regularly employed workmen pay an excess above the cost of their benefits, and thus are taxed, the workmen in greater need receive, in this case also, a mixture of insurance and relief.

Sooner or later, the taxed workmen may reverse the question now asked by some American writers and demand, as the British workmen are now demanding, why the general tax-

9. Minutes, p. 740, para. 23.

1. Mr. Winston Churchill said in Parliament: "... Compulsory schemes are exposed to this danger, that they inflict injustice on the superior workman by forcing him to bear the extra risks of the inferior workman, and it is for that reason that we come to the State subsidy. Herein lies the true function of the State subsidy." Parliamentary Debates, 5 Series, XXVI, May 25, 1911, p. 496.

payers should transfer to industry a burden which ought to be theirs. The mixture of relief and insurance thus raises ethical questions, a conflict between what may be termed the individualist justice principle and the solidarity principle. The first was in Mr. Churchill's mind when he spoke of the danger of inflicting "injustice on the superior workers."² Similarly Sir William Beveridge, after characterizing the British system as "the dole officially miscalled insurance," declares that adjusting "insurance premiums to risks . . . is desirable, not merely or mainly on grounds of equity, but in order to enlist the interest of employers and workpeople on behalf of the insurance fund, in place of uniting them as at present in more or less open conspiracy against it."³ An entirely different standard of justice was held by the German Ministry of Labor in submitting the unemployment insurance act to the Reichstag. It declared in its memorandum: "True, it may be granted that there is a closer correspondence with the idea of pure insurance if each occupation group bears the risk of unemployment peculiar to it. From the standpoint of an insurance system with a pronounced social character, however, it is unquestionably just to urge that occupation groups less exposed to unemployment take over part of the risk for those more exposed."⁴

The mixture of relief and insurance, and the controversies about the justice of the burden, have a further consequence as regards the level of the contributions. "Relatively high contributions may be acceptable if the purposes of the expenditure and the conditions under which it is incurred command substantial approval, whereas an absence of confidence in the

2. See preceding note.

3. Minutes, p. 722, para. 8; p. 723, para. 16.

4. Verhandlungen des Reichstags. III Wahlperiode 1924. Band 413, Anlagen zu den Stenographischen Berichten. Nr. 2885, 16 Dez. 1926, p. 49. German views on classifying risks are summarized in Carroll, M. R., *German Unemployment Insurance*, Washington, Brookings Institute (1929), p. 83. An excellent discussion of basic principles of social insurance may be found in Karl Pribram's *Die Verteilung der finanziellen Lasten in der Sozialversicherung*, in *Festgabe für George von Schanz*, Tübingen, Mohr, 1928, I, pp. 210-230.

general conditions of a scheme may cause the weight of contributions to appear oppressive."⁵

Expenditures are affected as well. As relief is already in the picture, some groups will wish to extend that feature. Consider the outspoken Labour memorandum to the Royal Commission: "We cannot agree for a moment when the mere fact of a man being fairly regularly employed entitles him to benefit as a right when unemployed, that one less fortunate, who really needs more benefit and not less, should be deprived of it altogether or subjected to a prying inquiry into his domestic circumstances as a condition of receiving it."⁶

It must be admitted that a system based on a mixture of several principles, instead of on one, is not on that account necessarily unstable. A tariff policy based upon a mixture of revenue and protection may command persistent support. An endowment life insurance policy based upon a mixture of insurance and saving is attractive to many persons. Trade union unemployment benefits, a mixture of many principles, have shown real vitality. It has been said that "social insurance might almost be defined as a form of insurance which cannot live up to the exacting laws of insurance science."⁷ The other forms of social insurance, however, do not have the instability of unemployment reserves.

How may we account for the instability of unemployment reserves on the pooled basis? The difficulties arise from the impossibility of so defining the groups that an effective sentiment of solidarity is obtained. A national pool is too large. A smaller group, a trade or an industry, can have solidarity, if the transfers in and out are rare and insignificant. A company plan, like that of the General Electric Company with its assessment of executive salaries and its loans to needy employees, has enough of solidarity to support its mixed character, when participation is limited to regular employees

5. First Report, Royal Commission on Unemployment Insurance (1931), p. 31.

6. Memorandum of the Trade Union Congress General Committee. Minutes, p. 967, para. 2.

7. Rubinow, I. M. *Social Insurance*, New York, Holt, 1916, p. 11.

temporarily laid off. As explained before, however, a state scheme neither could nor would make any such plan universal. The principal obstacle to effective solidarity comes from the difficulties of defining membership which arise from the variations in the amount of employment. Membership may be defined in terms of number of contributions, number of benefits, or a fixed ratio between contributions and benefits. Any one of these definitions will include very different groups in different periods. If, for example, membership is defined in terms of number of benefits, a long period will include those genuinely attached to the group in periods of depression, but in periods of prosperity will include workmen whose claims to membership are very remote. Any definition, moreover, will appear arbitrary in drawing a line between individuals whose employment or unemployment is a matter of chance. The instability of the pooled plans thus arises from the instability of industry itself.

Unemployment reserves on a deposit or savings basis meet the strictest requirements of individualist justice. Each unemployed workman can draw on the accumulations in his own account. There is no open or disguised taxation and no admixture of relief. The savings basis would carry over into unemployment reserves the individualistic indifference to the chance element in misfortune where the chance is not an insurable risk. There can be no question, on the other hand, that no sound and acceptable plan of dealing with the unemployed can get along without some appeals to compassion and generosity. The individualistic answer is that the first line of defense against the ravages of unemployment can be based solely on the savings principle, and that after all any plan of unemployment reserves is nothing more than a first line of defense. The second line of defense must be different. Compassion and generosity can and must be used in providing for those who have exhausted their claims to benefits and who may be differentiated from the class of the chronically poor and the unemployable, into which there is grave danger that they will fall. No plan of unemployment reserves will suffice for all the unemployed. Economic theory must point this out,

for it is often overlooked; even the economic theory is of little help in understanding the problems of constructing a second line of defense behind the reserves.

The first public suggestion of the savings basis came from Mr. Thomas F. Tarbell, in his presidential address to the Casualty Actuarial Society in May, 1931. He said: "There is one avenue of approach to the problem which . . . possesses considerable merit as a substitute for insurance. The basic principle of the plan is compulsory personal savings to provide the unemployed individual with funds during the period immediately following cessation of employment from causes beyond his control." He advocated that contributions should be continued "until a sufficient reserve or fund had accumulated to (the workman's) credit to provide unemployment benefits for a specified period of time."⁸ The first plan for unemployment reserves on the savings basis was that of J. I. Case Co., of Racine, Wisconsin, which became effective in November, 1931.⁹

An unemployment reserve plan on the savings basis which provides that the employers' contributions should cease when the maximum amount of protection had been provided would prove an incentive to stabilize employment just as effective as a maximum per capita "insurance" plan like that provided in the Wisconsin Act. More important, any other plan would instantly raise the question of continuing accumulation after the objective, adequate protection against unemployment, has been obtained. Professor Pigou has already made the point that pooling is economical in that it does not pile up a reserve for those who will never need it.¹ A scheme which did not provide for a maximum amount of protection would appear to be open to objection.

8. Proceedings of the Casualty Actuarial Society, XVII, part II, no. 36, pp. 174-175.

9. The Wisconsin Industrial Commission has announced that in approved voluntary plans, permitted under the act as departures from the general standards, employee contributions may be set up in individual employee savings accounts. Handbook on the Wisconsin Unemployment Compensation Act. Bull. No. 1 on Unemployment Compensation. Madison (1932), pp. 47, 48.

1. Industrial Fluctuations, Macmillan, London (1927), pp. 330-331.

Nevertheless the present writer, altho he once suggested a savings plan with a maximum amount of protection,² is led on further reflection to oppose it. Under such a plan, it would be to the immediate interest of the employers to resist all claims for benefits because benefits would reduce the reserve below the maximum. The employers would have also an incentive to discriminate, in hiring additional workmen, against those whose reserve account was low, that is, against those who were newcomers to industry or who had suffered much from unemployment. Such discrimination, which would perpetuate the misfortunes of the unemployed and make them cumulative, would probably make such a plan unacceptable as well as undesirable. If unemployment reserves are to be put upon a savings basis, the contributions would have to continue throughout employment. The reserves would have to combine provisions against unemployment and provision for retirement. The need of savings for old age (or for dependents in the case of early death) is so great that accumulations beyond the amount necessary for unemployment cannot be dismissed as uneconomical or unnecessary. Such a plan could permit some groups to contract out of the general state scheme and set up an unemployment insurance scheme with part of the contributions. Some such voluntary groups could meet the technical requirements of homogeneous classes or an effective solidarity, altho they could only be exceptions to a general scheme.

The outcome of this theoretical analysis may be summed up in the following propositions, stated without elaborate qualifications:

- (1) The burden of employers' contributions is shifted backward to the workmen.
- (2) The wisdom of contributions from employers and workmen is a question of expediency, not of ethical standards.
- (3) Contributions from employers add little to existing incentives to stabilization.

2. Unemployment: its literature and its problems. *Quarterly Journal of Economics*, XLVI (November, 1931), pp. 182-183.

(4) The technical requirements for added incentives — prohibitions of casual employment and liability limited to workmen dismissed — will probably not secure widespread adoption.

(5) Unemployment is not an insurable risk.

(6) Unemployment reserves on a pooled or "insurance" basis are mixtures of insurance and relief, which are as unstable as employment itself.

(7) Unemployment reserves on a savings basis require extension to include retirement as well as unemployment.

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THE THEORY OF RAILWAY RATES ONCE MORE

Professor Locklin, in his valuable paper, has paid me the compliment of discussing once more the theory of railway rates set forth in these pages some forty years ago. I am led by his exposition and criticism to say very briefly a further word on the subject.

Some general statements made by me at that early date are not tenable. I should not now say, as I did in 1891, "the conditions for the application of the theory of joint cost exist in any industry in which there is a large plant, turning out not one homogeneous commodity, but several commodities subject to conditions of demand from different quarters with different degrees of intensity" (or, one would put in these later days, with different demand schedules, and different elasticities of demand). The mere fact that a plant can turn out heterogeneous goods does not mean that a case of joint cost arises. It means only that the plant, or a set of plants, will be turned to a greater extent to some of the goods than to others; more of some kinds of things will be produced than of others. If, indeed, there be great difficulty in adaptation to one or the other kind, either because of technological or marketing considerations, something like the joint-supply case may arise, for a period of considerable duration. But this difficulty arises in no considerable degree for a railway plant.

What does signify for the theory of railway rates is that for very long periods, perhaps indefinitely, a plant may not be continuously workable to full capacity for the main commodity or service among several which it is capable of yielding. There may be a persisting element of unused capacity; unused, that is, if the same charges be made for all the goods as for the main one. By main good I mean that to which the apparatus is first turned as offering the largest profit — the largest in the sense of the greatest return over and above its direct cost or prime cost. The most striking case is (or

was?) that of electrical current. Plants for generating it were first constructed primarily in order to supply light. Their capacity had to be enough to carry the peak load, which comes at evening. During the day there was unused capacity. The same was the case with the distributing plant. Both, however, could be used not only for supplying light — the main product — but during the day for power. We all know how profoundly the growing utilization of electric power has affected a wide range of industrial operations, and has affected also the price policy of the electric industry itself. But the use of power could not be brought about, at least during the earlier period, unless the rates were made lower than for light.

It is generally agreed, I think, that even under free competition these conditions would lead to discrimination in charges explicable on the principle of joint supply. Just how long such conditions have persisted in this particular case, I am not well informed. Evidently all depends on the continuation of the difference in the demand schedules. The demand for power has increased — relatively, that is, to the demand for light.¹ With growing familiarity, and with the adaptation of other equipment, the demand curve for power has shifted fast and far to the right — apparently faster than the similar shift in the demand curve for light. Evidently, on the other hand, the competing supply of power through direct use of coal and steam has been a factor of more importance than competing supplies of light have been. These shifts, however, do not affect the validity of the illustration for the main thesis: unused capacity presents a case for the application of the theory of joint supply. It is with this case in mind, at all events, that I shall use the terms "joint cost" or "joint supply" in what follows.

Another illustration, simpler but of much less quantitative significance, is suggested by a remark of Professor Pigou. It is that of hotel accommodations in season and out of season, notably at holiday and vacation resorts. A hotel plant which can be used to the full at the peak of the season can be used at

1. See the discussion in Jones and Bigham, *Public Utilities*, ch. VII, especially pp. 289 seq. and the diagrams pp. 292, 293.

other times only if rates be reduced. The case is clearly one of unused capacity — persisting and inevitable. Under fullest competition and for an indefinite period, there are differences in the hotel charges explicable on the principle of joint supply.²

To turn now to railways, it is to be remarked at the outset that there is a historical difference between American and English conditions which may serve in good part to explain the difference in emphasis between Professor Pigou's treatment of railway rates and my own. Professor Pigou, while admitting that joint supply explains some things, has laid much greater stress on the factor of monopoly; while I have laid most stress on joint supply, admitting that monopoly plays its part. Now, in 1891, when I first turned to the problem, American conditions were very unlike what they are now. Then railways were being built fast, and very largely into new regions and ahead of the traffic. The factor of unused capacity was important. That of monopoly was much less wide-ranging than in later days; yet it bulked large in public controversy, and was commonly assumed to be the one explanation of the then perplexing conditions. British railways, on the other hand, were never built ahead of the traffic, and the factor of unused capacity never played such a part as it does for the railways of a pioneer country. With the march of time American railways have come closer and closer in character to those of settled systems adapted to existing traffic and existing industries. Competition has by no means ceased entirely; but it has been smoothed, its ways much modified, its range of application lessened. American railway conditions thus have become less strikingly unlike those of Great Britain, France, Germany, and the

2. The pertinent passage is in Professor Pigou's *Economics of Welfare*, third edition, p. 277. It occurs in the chapter on Discriminating Monopoly, and is there used to illustrate non-transferability of a commodity. It does illustrate non-transferability very happily. But its appearance in a chapter on monopoly is puzzling, since monopoly can hardly bear on the case. A hotel may indeed have a quasimonopoly of prestige or connection; but this would seem to be a short-period affair. It is the joint-supply element arising from unused capacity which explains the persistent and ubiquitous "discriminations."

problems to be analyzed have become more nearly the same.³ One would be tempted to say that the monopoly factor is now everywhere quite the more important one, were it not that — quite apart from much continuing competition between the railways themselves — the competition from automobiles has opened a new chapter in transportation history, with far-reaching possibilities as regards the effects of this competition, the ways of still utilizing the existing railway plants, and the inevitable changes in the rate structure.

It is not easy to say how great remains the weight to be given the factor of joint supply. That it explains some things, e.g., back loading, is admitted on all hands. It explains also, such a case as that of railway rates lower for the long haul than for the short haul where there is water competition. How far it goes toward explaining the classification of freight for rate purposes I am not clear. There is here a medley of influences — differences in direct (prime) cost; perhaps monopoly influence; perhaps joint cost in the make-up of trains. The conditions are highly complex, and I make no pretence of adequate information or understanding.

One or two general considerations may be worth presenting; and on these I venture to put down a few very brief concluding remarks.

In the first place, the peak-load element remains important for railways; and this particularly when one draws conclusions from the fact of extensions of plant capacity. Almost all American railways, as is well known, have enlarged their plants during the past generation. Double track has replaced single track over a very considerable mileage; even third and fourth tracks have been added on some stretches of dense traffic; sidings have been increased in number and lengthened; terminal yards and structures amplified. This plain fact of steady enlargement of plant may be adduced to prove that there is no such thing, in the long run, as unused capacity. I am not so sure, however, and for the reason already intimated: the peak load factor. A plant may be needed to the

3. Something of this sort I have said already in my *Principles of Economics*, third edition, vol. II, pp. 417, 418.

full for the maximum traffic — the seasonal or industrial peak — and yet by no means utilized to the full at all seasons and times. And this may be the case not merely on occasions, irregularly, incalculably — for that fringe of adjustment and free play which is always to be reckoned with in any industry — but persistently, from the particular technological conditions and the particular demand conditions. I cannot but feel that this factor persists to an extent by no means negligible, and has its part in explaining the peculiarities of railway rates.

A second general consideration is that every attempt to figure out the total expenses of a given item of traffic, or a given group of items, has failed. Accountants and economists have wrestled repeatedly with the problem, endeavoring to allocate the overhead and general expenses in such way as to make it possible to count up with exactness the total expense of individual items or even of large classes (e.g., passenger and freight). For many purposes of economic theory and description, and not least for the outstanding purposes of public regulation of rates, exact figures of separate cost would be of inestimable value. It is true that precise figures, to the last decimal, are often set down, and quoted in judicial proceedings; but on examination they always prove to rest on some allocation of overhead charges which represent, not their actual incurrence for the traffic, but the way in which it is believed or supposed they *ought* to be distributed.⁴ The complete failure to get figures really exact, notwithstanding so many persistent and well-directed attempts, seems to prove that they cannot be had. This is just what one would expect under conditions of joint supply, and not what one would expect if monopoly were the line of explanation solely or even chiefly applicable. It is the essence of joint supply that the total specific costs of any one of the joint products cannot be ascertained. The derived "supply price" of the Marshallian type is, of course, quite a different matter from an actual

4. I may refer to the highly competent article by W. J. Cunningham in this Journal, vol. 31 (February, 1917) and to the vigorous passage there quoted (p. 211) from A. S. Olmstead.

specific cost. The fact that the latter continues to be elusive, in face of so many endeavors to pin it down, would seem to show the persisting presence of a large element of joint cost.

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THE ELASTICITY OF DEMAND FROM FAMILY BUDGETS

In an article under this title by Mr. Waugh in the November issue of this Journal there is an unintentional misrepresentation of my discussion of this matter in Appendix II to my *Economics of Welfare*. According to Mr. Waugh, I obtain a "budgetary elasticity" for particular commodities (as defined by him on p. 135) and then mistakenly treat this as equivalent to elasticity in the Marshallian sense. In fact, I am concerned solely with elasticity in the Marshallian sense, and I expressly state that it is not possible to derive this elasticity for particular commodities from family budgets. My analysis is directed to show that the *comparative*, not the *absolute*, elasticities of demand for different commodities can be so derived.

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THE WOODEN MONEY OF TENINO

On December 7, 1931, the Citizens Bank of Tenino (pronounced Ten-nine-o), Washington closed its doors. This was only one of 1,055 bank suspensions in the fourth quarter of 1931; and the bank was relatively small, in a comparatively unknown town in Western Washington.¹ A few months later, however, this town "made" the rotogravure section of a metropolitan New York newspaper. Its unique "wooden money" was described by radio speakers, depicted in news reels, and written up in the newspapers of the country generally. On April 7, the wooden money experiment was described on the floor of the Senate during a debate upon reconstruction measures.² All of this publicity, for the equal of which chambers of commerce in larger centers would have paid roundly, came to it unexpectedly and gratis.

When the bank closed, the buying power of the depositors was at once "frozen." No Reconstruction Finance Corporation then existed to which the liquidator could turn for an advance with which to make an immediate partial payment to depositors. The nearest banks were 15 miles distant; no relief could be had, therefore, through loans from other banking institutions upon depositors' claims. Trade was jeopardized just at the holiday season. To meet this crisis, the Chamber of Commerce decided to issue scrip to be redeemed from liquidating dividends of the bank. Merchants agreed to accept the scrip at face value in trade. A scrip committee, consisting of F. W. Wickman (physician), D. M. Major (publisher) and A. H. Meyer (dentist), was appointed to carry out the plan.

The receiver of the bank estimated that a liquidating dividend of 25 per cent could be paid within a few months. This was subsequently proved to be optimistic, but was the basis

1. On December 31, 1929, the bank had deposits of \$211,000. At date of failure these had been reduced to \$112,000.

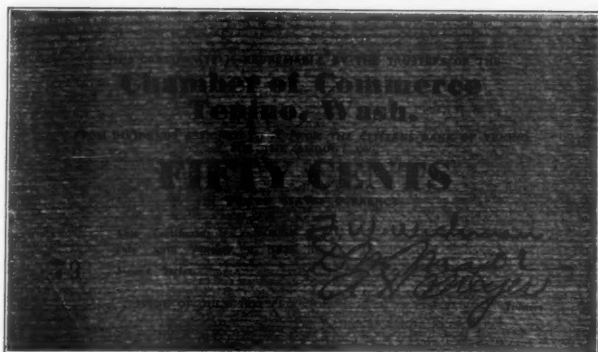
2. Congressional Record, April 7, 1932, Page 7665.

upon which scrip was issued. All depositors were invited to assign to the Tenino Chamber of Commerce approximately 25 per cent of their proved claim against the closed bank. The depositor then received a certificate or certificates in the form shown in the accompanying illustration. Paper certificates were issued in denominations of 25 cents, \$1.00, \$5.00 and \$10.00. The certificates were $5\frac{1}{2}$ by $3\frac{1}{4}$ inches, printed upon lithographed forms and signed personally by the three trustees constituting the scrip committee.

The issue of paper scrip has been resorted to by other communities under similar circumstances in order to stimulate local trade and hence was in no sense unique. The feature of the Tenino plan which brought it international fame was hit upon accidentally. The paper scrip was printed at the office of the local paper — the Thurston County *Independent*. The printer had on hand some pieces of ply-wood of post card size. Forty 25-cent wooden certificates were printed for curio purposes in December, 1931. This constituted the first issue of "wooden money." A few of these wooden certificates were mailed out of the community. There was an immediate and widespread demand for more "wooden wampum." Eight additional issues followed in January, February, March, April, May, June, July and August, 1932 — a total of 27,000 pieces. In a few weeks the town and its unique money were being widely talked of. Requests for wooden money came from all over the United States. A letter was received from New Zealand; certificates went to other foreign shores. Washington bankers were asked by eastern correspondents to furnish samples of the "wooden money." Enterprising merchants in nearby cities used it as a window display and, in some cases, sold it as souvenirs.

The greatest opportunity for distribution, however, was in the community itself. Tenino is located on the Pacific Highway about 15 miles south of Olympia, the state capital. Thousands of autos pass through the town daily, especially during the tourist season.³ Every Main Street service station,

3. In 1930, a traffic survey was made by the Bureau of Public Roads in conjunction with the highway departments of the western states.



hotel, and restaurant advertised "wooden money." More than one gasoline tank has been filled or meal served in recent months because the tourist had heard of "wooden money" and wanted to obtain samples. Quite aside from the business-getting advantage to the vendor was the community gain in distributing the wooden money where most pieces will be held permanently as curios.

The accompanying cut is an exact reproduction of the face of the wooden certificates, but is quite inadequate to show how thin, strong, and pliable these certificates really are. Measuring $3\frac{1}{4}$ by $5\frac{1}{2}$ inches, they are made of two-ply slice-wood of Sitka spruce with a sheet of tough paper between the two surfaces. The thickness of a 25-cent piece in the author's possession by micrometer measurement is .027 of an inch; i.e., there are 37 to an inch. This same certificate has been bent without breaking into a semi-circular arc which brought the edges of the piece within an inch of each other.

The average daily density for northbound traffic at the point on the Pacific Highway nearest Tenino was as follows:

Passenger cars, 2,680; trucks under 3-ton, 204; trucks over 3-ton, 42; busses, 57. Maximum traffic was 6,896 total vehicles. Winter average was 2,168 total vehicles. This represents very closely the traffic conditions through Tenino; presumably the total traffic was approximately double the traffic north.

The surface of the wood is unfinished so that the certificates can be readily printed. This has the further advantage of preserving the lustre and grain of the wood. The printed statement on the face of all certificates is uniform except in the color of the ink. The dollar pieces are printed with brown ink, the 50-cent pieces with red, and the 25-cent pieces with blue. The reverse side has a conventional design, together with a picture of George Washington on the 25-cent ones and of Abraham Lincoln on the 50-cent and \$1.00 pieces.

When an idea succeeds as phenomenally as wooden money did in Tenino there is always danger that it will be brought into disrepute through abuse. The trustees of the Tenino Chamber of Commerce have not been victims of that temptation. The total issue of paper scrip was \$3,200, of which only about \$2,000 was actually circulated. The authorized issue of wooden money is \$6,800, making a total in paper and wooden scrip of \$10,000. The paper was in denominations of 25 cents, \$1.00, \$5.00, \$10.00; the wooden, 25 cents, 50 cents and \$1.00. The trustees report that almost 27,000 pieces of the wooden money have been circulated; an overwhelming proportion was in 25-cent pieces.

Thus far the bank has declared two liquidating dividends of 10 per cent each — the first on April 1, 1932, and the second on September 14. It is hoped that there may be a third dividend of 10 per cent by January 1, 1933. When the first paper scrip was issued it was understood by merchants and townspeople generally that it would not be redeemed until a liquidating dividend was paid. It is explicitly printed upon the certificates that they are redeemable "From Dividends Assigned to it from the Citizens Bank of Tenino." An early dividend of 25 per cent seemed to be a conservative estimate. The extremely adverse conditions of the past year have slowed up the liquidation. Altho it was expected that no scrip would be redeemed until the full amount was in hand in cash to take care of it, the trustees upon receipt of dividends began to redeem all scrip presented by local merchants, relying upon the outside sales to more than equal the remainder. Practically all of the paper has been received and

cancelled, but so far (November 1) the redemption of wooden money has been less than \$20. It now would seem that very little wooden money will ever be presented for redemption. Nevertheless, in line with their conservative policy to date, the trustees intend to hold cash on hand equal to their outstanding liability until the liquidation is finally closed and all legal responsibility ended. At present the assets of the fund consist of a balance in a neighboring city bank, cash held in safe deposit, and a limited number of school warrants purchased from teachers to make their salary income available.

The extent to which the community will profit from outside sales of "wooden money" cannot be determined until the liquidation is closed. The trustees estimate that they will make about \$4,500 net. The wood for the certificates costs less than a cent each in quantity lots, the notes are printed locally at a moderate expense and the trustees have been paid a merely nominal amount for the labor of taking assignments, personally signing the certificates, recording all issues, redemption of scrip and other duties incident to putting the money into circulation and providing for its ultimate redemption.

The profits, whatever the amount, will belong to the Chamber of Commerce. The final disposition to be made of them has not yet been determined. Tentatively the trustees are contemplating the purchase of the bank building, a small but attractive structure, which can be obtained for perhaps \$3,500 to \$4,000, about one half its cost. The advantages of purchasing the building are, that an otherwise illiquid asset can thereby be disposed of to the general advantage of the depositors of the bank; and that the community may thereby more readily secure banking facilities of some kind. At present, branch banking is illegal in Washington, but there are a number of strong group organizations, units of which are found in nearby communities. If the law should be revised to permit branches, or a strong group system should be approached to create a subsidiary bank in Tenino, the exist-

ence of a suitable building would be a strong inducement.⁴

The enterprising character of the Chamber trustees is evidenced by their plan to dispose of the cancelled paper scrip. A scale of prices has been established ranging from 20 cents for the 25-cent pieces to \$1.00 for the \$10.00 ones. A number of sales have already been made, but the extent to which collectors will buy the paper scrip is problematical. Some of the certificates of the first (December, 1931) issue of wooden money have sold as high as \$2.50 for a 25-cent piece. This fact and the very wide publicity given to the wooden money lend encouragement to the trustees in their newer venture.

As might be expected the success of the Tenino plan promoted imitation. Other communities stricken by bank failure tried to put out a form of "money" based upon a distinctive local product or industry. None of these has succeeded in even a small measure in duplicating the success of the Tenino "wooden money."

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4. Since this was written, the purchase of the bank building has been made.

MEMBER BANK RESERVES AND BANK DEBITS

There is a strong probability that important changes in the provisions governing the reserve requirements of member banks will shortly be enacted. The changes are likely, moreover, to approximate in some degree the recommendations of the able official Committee on Bank Reserves.¹ These recommendations, despite their revolutionary character, appear to have the support of the reserve administration and to have encountered, as yet, little opposition from bankers. They have, moreover, been approved by various monetary writers.² While I am reluctant to raise any objections to proposals so widely approved I feel that all aspects of the problem should be thoroly explored before important changes are made which it may be very difficult to rescind in the future. This is particularly true of the Committee's most revolutionary proposal, that reserve requirements should change automatically with changes in bank debits. The following discussion will be confined to this single proposal.

The theoretical basis of the proposal put forward by the Committee is thus stated: "Since the volume of member bank credit needed to meet the legitimate needs of trade and industry depends on the rate at which credit is being used as well as on its aggregate amount, it is essential for the exercise of a sound control that legal requirements differ in operation between highly active deposits and deposits of a less active character."³ One's first reaction to this proposal is favorable. Most economists would agree that in the problem of the business cycle the rate and character of spending is of greater importance than changes in the volume of means of payment.

1. The Report of the Committee on Bank Reserves of the Federal Reserve System. Government Printing Office, Washington, 1931.

2. J. M. Keynes, *Economic Journal*, March 1932, pp. 27-31; J. W. Bell, *The American Economic Review Supplement*, March, 1932, pp. 203-207; F. A. Bradford, *ibid.*, p. 239. For an adverse comment see B. M. Anderson, *Chase Economic Bulletin*, vol. xii, No. 1.

3. Report, p. 5.

It would seem proper, therefore, that the central bank should be able to exercise some degree of control over the rate and type of spending, and the Committee's proposal appears at first sight to give it this power. On closer study, however, difficulties arise.

It is worth noting at the outset that the words "rate at which credit is being used" are ambiguous. One might be justified in thinking that they are merely another way of referring to the velocity of circulation of deposits. Since, however, the plan is to calculate reserves according to the average daily debits to individual accounts, the word "rate" in this case means the absolute spending and not the number of times deposits are spent. If deposits increased, velocity remaining constant, the reserve requirements would be increased not only on account of the increased volume of deposits, but also on account of an increased absolute expenditure of deposits.

The theory underlying the proposal is, I feel, open to question. It is important to note that, despite the use of the words "legitimate needs of trade and industry," the Committee's proposal does not distinguish between the spending of deposits on goods and other types of spending. So far as reserve requirements are concerned, one expenditure of a deposit is as important as any other expenditure. Reserve requirements, in other words, would vary according to changes in the *total* expenditures of deposits and, in part, of notes.⁴ This concept of total expenditures, which at one time played an important role in monetary discussions, has gradually been relegated to the background as the analysis into the causes of changes in the value of money has progressed. Today few writers make any use of it. It corresponds, of course, to MV in the Fisher equation of exchange and equals the average price of the total number of things bought in the period in question. The total number of things bought includes goods (some but once, some very many times), services rendered by labor and capital, and an enormous volume of

4. Since withdrawals of cash are included in bank debits.

financial instruments of all kinds (bonds, stocks, and so on). As Mr. Keynes points out, T is not the volume of output, nor is the average price of T the purchasing power of money. It is difficult to see how the concept of the average price of *everything* bought in a period can be in any degree significant. And yet this is the price level which is relevant to the concept of total expenditures.

It will probably be objected that this is an extreme attitude; that while admittedly there are many turnovers of money and many prices of things in the equation of exchange in which we are not interested, still the velocities and prices that are significant, such as the output and prices of goods and consumers' expenditures for goods, move in the same direction as the totals. While there is probably some truth in this, the correspondence seems to be so rough and uncertain as to make the totals a most unsafe guide. In 1929 the total monetary income of the community was estimated at between \$80 and \$90 million; total debits amounted to well over \$1,000 billion. Consumers' expenditures for goods and services therefore amount to much less than 10 per cent of the total expenditures of the country. Total expenditures of the country, as measured by bank debits in 141 cities, increased 64 per cent from 1925 to 1929, an annual increase of 13 per cent.⁵ At the same time the Bureau of Labor index of wholesale prices fell from an average of 103.5 in 1925 to 96.5 in 1929.⁶ It would, of course, be absurd to maintain that these facts indicated an increase in goods of more than 13 per cent per annum. Such a rate, assuming an equivalent increase in services and no change in population, would have meant a rise in average income by 100 per cent in eight years. Undoubtedly the increase in bank debits was accounted for in the main by financial transactions. This view is confirmed by the fact that debits in 140 cities excluding New York increased in this period by less than 7 per cent per annum.⁷ Again, in the first six months of 1930 when, judging by the fall in commodity

5. Annual Report of Federal Reserve Board, 1930, p. 130.

6. *Ibid.*, p. 224.

7. *Ibid.*, p. 130.

prices from 93.4 to 86.8, the demand for goods and presumably incomes were falling, bank debits increased, although normally they decline in the first half of the year. Similarly, bank debits in the latter half of 1920, when business activity was declining, were approximately as large as during the first half of that year. Moreover there appear to be good reasons for believing that the growth of financial expenditures relative to consumers' expenditures is a secular rather than a purely cyclical phenomenon.

The chief objection to the new proposal, therefore, is that it embodies in the Federal Reserve Act a banking theory to which it is very doubtful the reserve administration will long adhere. This theory is that any one expenditure of a deposit is of as valid economic significance as any other. We have noted times when it is evident that expenditures for goods did not change proportionally to changes in total expenditures; and indeed there is evidence that occasionally they have moved in opposite directions. Is there not danger, therefore, that the provision now favored by the reserve administration may prove embarrassing in the future? The increase in reserve requirements under the new plan, if applied up to 1929, would undoubtedly have been welcomed by the present administration. It is perfectly conceivable, however, that this automatic increase in reserve requirements would have hampered a reserve administration interested in the flow of finished goods in relation to consumers' expenditures, and in the relation between saving and investment. Again, in 1929 the increase in reserve requirements from June to October under the plan would have perhaps embarrassed a reserve administration concerned with the indications that saving was outstripping investment. Certainly the increase in reserve requirements which would have resulted from the enormous increase in debits in October and November during the stock market crash would have embarrassed any reserve administration which was under pressure to bring about a large increase in member bank reserves in order to avoid suspension of payments. The point, in other words, is that while an *automatic* change in reserve requirements sometimes may

aid policy, at other times the automatic change may be in a direction counter to that desired by the reserve administration.

It is quite true that there is a way of meeting this difficulty. If the automatically increased or decreased requirements for reserves, which in turn would lead to increased or decreased indebtedness to the reserve banks and a tendency for the volume of means of payment to contract or expand, should happen not to be in accord with Federal reserve policy, they could be offset by an appropriate open market policy. In this case, however, the automatic feature of the scheme would add another difficulty to the already sufficiently difficult problem of central bank control. Moreover, there is a real danger that the existence of automatic changes in reserve requirements may have the effect of inducing the reserve administration to adopt a more passive policy generally. If, however, the business cycle is to be substantially modified through monetary means, it will be at times essential that energetic action be taken *before* the forces making for an upturn or downturn in business are in full swing. There is, in other words, danger that we may again have to learn the painful lesson that non-discretionary rules embodied in law cannot provide the appropriate reaction to the ever-changing business situation confronting a central bank.

There are other objections to the proposal of a more specific nature. One of the arguments urged in favor of basing reserve requirements upon bank debits is that it will operate to check the growth of speculative situations and help to bring them under control. "It will increase requirements for reserves sharply for those individual member banks whose customers are at the center of an incipient speculative movement and so set in motion forces of a restraining nature at the focal point of disturbances. These forces will probably take different forms. Bankers whose requirements for reserves increase sharply as a result of these activities will find their lending power reduced somewhat and so will be less inclined to finance speculative developments. Customers with highly active accounts will probably be expected to maintain larger

deposit balances, or else the member banks will institute service charges based on the activity of deposits."⁸ The obstacle to speculation would presumably show itself in the form of higher interest rates.

The assumption underlying this reasoning is that speculators are more sensitive to interest rate changes than are any other class in the community. No assumption could be much further from the facts. If our experience in 1928-29 proves anything it is that speculators are the least sensitive to interest rate changes. We may quote the testimony of the Federal Reserve Board itself that the construction and foreign bond markets reacted to high interest rates long before the rates had any perceptible effects on speculation.⁹ In other words, if higher interest charges are resorted to for the purpose of contracting the means of payment used in speculation, it is very improbable that the contraction will, in fact, take place in the deposits thus used; the result will rather be that the diminution will take place in the industrial circulation. When to this is added the probable increase in brokers' deposits required by bankers in order to compensate for the increased reserve requirements, it will be seen that the result would be the direct opposite of that desired by the banking authorities. The reserve requirements would, in fact, tend in themselves to increase the absorption of deposits in speculation.

In the Report of the Committee no mention is made of the very considerable seasonal changes in the activity of deposits. Banking authorities have usually considered it to be part of their duties to offset purely seasonal changes in reserve requirements and interest rates. To base reserves on bank debits would, however, intensify seasonal fluctuations in interest rates, and render the stabilization of seasonal changes more difficult. This objection is partly removed by the Committee's plan to base requirements on the average activity of deposits in the preceding eight weeks; and it is not as important as the other objections.

8. Report, p. 18.

9. Federal Reserve Bulletin, April, 1929, p. 244.

Taking a longer point of view, the proposal is open to the objection that it may run counter to a future pressing need to economize gold. Altho the increase in reserves required by an increase in the volume of deposits would be less than at present, there is a likelihood that this will be more than offset by the increased reserves required by the steadily growing debits of the country. The Committee remarks that the "average turnover of bank deposits in this country increased steadily from 1914 to 1929."¹ With increasing urbanization, better communications and the growing importance of the financial side of economic life, this process may be expected to continue in the future. Moreover, there is a possibility that the volume of deposits necessary to sustain prices may be increased by the adoption of the new plan, since, as the Committee concedes, bankers are likely to offset the increased cost of their active accounts by requiring larger compensating balances rather than by instituting service charges.

The limitation of reserve requirements to 15 per cent of gross deposits is not as effective a check to increased reserve requirements as it appears. Included in gross deposits are time and demand deposits, certified checks, and amounts due to other banks. It can be seen that 15 per cent of gross deposits might amount to much more than double that amount if reserves were calculated as a percentage of individual demand deposits. If time deposits continue to increase, therefore, there is a possibility that total reserve requirements, expressed as a percentage against means of payment in the form of demand deposits, will increase indefinitely. A check to this tendency, but of an undesirable nature, would be offered by the competition of non-member banks. Should reserve requirements of member banks increase much beyond those of non-member banks, defections from the Federal Reserve System might result. This tendency would be strengthened in so far as member banks insist upon larger compensating balances, and so offer an inducement to customers with active accounts to shift to non-member banks. It may be noted in passing that a plan which requires bankers handling

1. *Op. cit.*, p. 9

the most expensive deposits to carry the highest reserves and banks handling the least expensive deposits the lowest reserves, can hardly be said to be "equitable," in the sense of tending to equalize costs as between banks.

On the whole it would appear that the objections to an automatic change in reserve requirements due to changes in bank debits outweigh the advantages. The proposal, on the other hand, to allow discretionary power to the central bank authorities to vary, in a uniform manner, the reserve requirements of all banks as occasion arises avoids practically all the objections to the automatic plan mentioned above; while it does make for more effective central bank control. This proposal was made in substance by the Federal Reserve Board in 1917 and was later revived by Mr. Keynes.² Even tho the power would not ordinarily be invoked, it would be a valuable instrument if need arose. Assuming a level of \$20 billion demand deposits, an increase or decrease of 1 per cent in reserve requirements would, in our system, be approximately as effective as the sale or purchase of \$200 million government securities in the open market. In such a delicate and difficult task as the determination of proper central banking policy it would appear to be a safe generalization that automatic rules render more difficult the task of central bankers, while discretionary powers facilitate it.

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2. J. M. Keynes, *Treatise On Money*, ii, p. 260.

SPECULATION AND THE STABILITY OF STOCK PRICES¹

Discussion of modern markets has long centered around the effect of speculation on prices. The organized markets are attacked because they foster speculation and defended because speculation renders substantial services. It is usually assumed by the defence that the existence of organized speculative markets makes possible a more open and general competition, in which differences of opinion are balanced more evenly than was formerly possible. It is supposed that a more delicate adjustment of supply and demand takes place, and that prices become more stable both throughout the season and from one season to another.

The gist of this reasoning was employed in the recent testimony of the President of the New York Stock Exchange,² who repeatedly justified short selling — the form of speculation most discussed and attacked of late — on the ground that it was essential to the maintenance of a free and open market, without which fluctuations would be so rapid and abrupt as to compel the closing of the Exchange. Short selling was held to be one aspect of speculation, and speculation together with investment were said to constitute the essence of an orderly market.

Economists are largely in agreement that the influence of speculation on organized produce markets is in the main to lessen fluctuations and to promote a nicer adjustment between production and consumption.³ To one of the keenest of them,

1. The author is greatly indebted to Professor W. L. Crum for his continued helpful advice throughout the preparation of this paper.

2. Cf. the Hearing before the Committee on the Judiciary, House of Representatives, Seventy-Second Congress, First Session, serial 5, part 1, and Hearings before the Committee on Banking and Currency, United States Senate, Seventy-Second Congress, First Session, part 1.

See also the further "Statement" by Mr. Richard Whitney to the Governing Committee and the Membership of the New York Stock Exchange, issued August 24, 1932.

3. See, for example, J. S. Mill, *Principles of Political Economy*,

stock exchanges are the pattern on which markets have been formed for dealing in many kinds of goods, and those on which international securities are traded and in which competition is subject to world influences constitute the nearest approach to a perfect market.⁴ Professor Taussig, tho he states the fundamental effect of speculation to be the lessening of fluctuations, confines himself to produce markets, and holds the advantage of stock exchange dealings to be not the minimizing of fluctuations, but rather the promotion of investment.⁵ On the whole, it is probably too much to conclude that accepted economic theory and theorists would, without considerable qualification, substantiate the claims of the Stock Exchange President that speculation in general and short selling in particular "by restraining inflation and cushioning sharp declines, tends to stabilize the fluctuations of prices."⁶

If Mr. Whitney's statement is correct, it seems fair to extend its implication, and to expect that, as the facilities for trading on the stock market become more refined, price fluctuations should tend to be confined within narrower limits. With reference more specifically to short selling, the period during which that practice was most actively engaged in should, in the absence of intervening forces, show a price range smaller than in those years when it was resorted to less. It is the purpose of the present article to see to what extent such reasoning finds confirmation in actual experience.

For this study the behavior of security prices on the New York Stock Exchange was analyzed over the fifty-six years from 1872 to 1927, both inclusive. These years were divided Book IV, Chapter II, Sections 4 and 5; Alfred Marshall, *Principles of Economics*, Book V, Chapter 1; and F. W. Taussig, *Principles of Economics*, Vol. I, Chapter 11.

Cf. H. C. Emery, *Speculation on the Stock and Produce Exchanges of the United States*, and A. P. Usher, *The Influence of Speculative Marketing Upon Prices*, *American Economic Review*, March, 1916, pp. 49-60.

4. Marshall, *Principles* (Eighth Edition), pp. 328-329.

5. *Ibid.* (Third Edition Revised), p. 164.

6. *Op. cit.*, Hearings before the Committee on Banking and Currency, p. 188.

more or less roughly into three periods: 1872-1896; 1897-1914; and 1915-1927. The earlier limit of the first interval was decided upon not only because adequate and comparable data cannot be obtained prior to 1872, but also because that year practically marks the beginning of the establishment of a continuous market in stocks.⁷ Previously there had been nothing more than "calls" in the morning and afternoon, with an intermittent market in the so-called "Long Room" of the Exchange.

This first period may be called the formative one in American Stock Exchange history. During these years many changes occurred, practically all of which had the effect of improving the technique of the market and consequently refining the process whereby buyers and sellers of securities could come together and carry on their transactions. The first telephones, for example, were introduced in November, 1878. In the following year forty new memberships were added; two years later an electric annunciator board was installed to facilitate the conduct of business; and soon after this, in 1885, the Department of Unlisted Securities was established. The mechanical aids were in part the result of a gradually increasing public participation in stock market activities, and in part had the effect of bringing new business to the Exchange through increasing the facility with which purchases and sales could be conducted. It was not until December 15, 1886, however, that this was reflected in a total volume of daily sales exceeding 1,000,000 shares. The final incident of importance during this period came very near its close. This was the organization in 1892, on the one hundredth anniversary of the signing of the original brokers' agreement, of the Stock Clearing House. Such refinements as these are important adjuncts of any organized Exchange; and it appears reasonable to expect, that when once they are in full operation, the process of bringing buyers and sellers together in such a market would be accompanied by smaller price fluctuations than in one where the adjustment between supply and demand was less easily accomplished. In the

7. The exact date is September, 1871.

absence of other influences, therefore, it is to be anticipated that on the whole greater variations in the prices of securities would be found in the period 1872-1896 than in later years, when the market technique was more highly developed.

The above noted changes are not the only reasons for commencing the second interval with the year 1897. This marks the beginning of the first major combination movement in American industry. The spectacle of gigantic amalgamations and the enthusiasm engendered thereby gave a significant impetus to popular participation in the financing of these enterprises, with the result that the general public probably became really stock-market conscious for the first time. It is convenient to end this period with the closing of the Exchange in July, 1914, due to the European War.

The third period with which this investigation is concerned runs from 1915 to 1927. This is the period when, as there is indirect reason to believe, short selling first assumed major proportions.⁸ It will therefore be particularly interesting to observe how price fluctuations in these years compared with those in which the practice apparently played a very much less active part. The years following 1927 are purposely omitted in order to avoid the most highly erratic phase, that of the recent speculative movement.

The extreme diversity of stock price fluctuations is an important obstacle to their measurement. Ideally, of course, every distinct use to which an index number is to be put requires one especially designed for it. Practically, however, save in rare instances, limitations of time, money, and technical skill preclude the construction of a series exactly suited to the investigator's needs. In this case, unfortunately, an entirely satisfactory index of security price variations is not easily obtainable. It may indeed be impossible to construct such a measure. But there are available comparable statistics of stock prices over a sufficiently long period of time to enable one to get a tolerable answer to the questions involved in the present study. The Dow, Jones averages of industrials, which

8. Set forth in a paper which the author hopes shortly to publish.

have been calculated from the year 1897, can be had in convenient form, and the New York Federal Reserve Bank has carried the computations back (with insignificant differences) to 1872.⁹ These figures, with necessary corrections to be described later, will serve the present purpose.

Two tests of price fluctuations were applied. First, an arithmetic mean of monthly high and low industrial stock quotations was calculated for each of the three periods comprising the entire interval of time covered. These monthly indexes were then averaged to get a single quotation for each January, February, March, etc., for each period. Finally, a mean monthly difference for each interval of time was computed by noting the amount of price variation of each "typical" month from the month immediately preceding it and dividing by eleven. The results are given in Table 1.

For the second test the mean of the average monthly price range for each period was calculated, and then expressed as a percentage of the price level for that particular interval of time. Throughout the study no attempt was made to achieve a high degree of statistical refinement, the arithmetic average being relied upon in all cases.¹ In this instance, the mean monthly range for each period was derived by averaging the difference between the indexes of the monthly high and low quotations for each year. For example, the "typical" monthly price range for the period 1872-1896 was obtained by finding the average monthly spread for each year and dividing by twenty-five, the number of years in that interval. The mean annual spread was computed in a similar manner. The level of prices in each period was obtained by simply averaging the means of the monthly high and low quotations. This appears in Table 2.

9. These data were put at the writer's disposal by the Reserve Bank authorities.

The very small sample of stocks included in both of these series may of course be a serious drawback so far as fluctuations in them are intended to be representative of all securities.

1. The geometric mean is undoubtedly superior for measuring changes in prices over a period of time, but the labor involved in its calculation is so much greater as to preclude its use in this study.

TABLE 1
MONTHLY AVERAGES OF THE INDEXES^a
(Unit: \$1)

Period	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Average of the Variations from Month to Month ^b
1872-1896,	52.76	53.28	53.28	53.32	53.08	52.72	52.04	52.12	52.64	52.80	52.04	52.36	
Variation of each month from the preceding month, . . . .		.52	0	.04	.24	.36	.68	.08	.52	.16	.76	.32	.43
1897-1914 ^c ,	72.25	71.77	71.77	72.74	72.08	72.02	72.23	73.33	72.71	71.83	72.54	73.03	
Variation of each month from the preceding month, . . . .		.48	0	.97	.66	.06	.21	1.10	.62	.88	.71	.49	.56
1915-1927,	99.72	99.64	99.63	100.27	100.93	101.97	104.13	105.76	108.06	108.68	108.92	109.57	
Variation of each month from the preceding month, . . . .		.08	.01	.64	.66	1.04	2.16	1.63	2.30	.62	.24	.65	.91

^a The indexes are simply the arithmetic averages of monthly high and low prices. From 1872 to 1896, the prices are actual highs and lows; for the other periods they are high and low closing prices. They should be observed that, into the indexes so constructed for the latter years differ slightly from the Dow, Jones averages, which are obtained by averaging daily closing prices. The discrepancy is not great.

^b Uncorrected for secular trend.

^c Not including December, 1914.

Difficulty was encountered in computing the measures for both tests arising from the fact that the Dow, Jones data were available in the form of high and low *closing* quotations, whereas the monthly indexes supplied by the New York Federal Reserve Bank were derived from a series based upon

TABLE 2
PRICE RANGES (UNCORRECTED)
(Unit: \$1)

Period	Average Monthly Range	Level of Prices	Average Monthly Range Expressed as Percentage of Price Level	Average Annual Range	Average Annual Range Expressed as Percentage of Price Level
1872-1896 ^a	4.68	52.70	8.88	15.07	28.60
1897-1914 ^{b,c}	4.54	72.36	6.27	19.46	26.89
1915-1927 ^b	6.85	103.94	6.59	32.50	31.27

a. Actual monthly high and low prices.

b. High and low closing prices.

c. Not including December, 1914.

actual monthly high and low prices of the twelve industrial stocks used in the Dow, Jones averages in 1897.² The degree of difference thus introduced into the indexes for the periods ending in 1896 and beginning in 1897 was not thought sufficiently great to warrant undertaking the laborious task of making the necessary correction in the application of the first test. But in the second, where price ranges are involved, it is obvious that the spread between actual high and low quotations may be so much greater than the range between high and low closing quotations as to compel taking notice of that fact. Accordingly, it was decided to attempt to compensate for this difference by a process of sampling.

For each of the periods, 1897-1914 and 1915-1927, actual monthly high and low quotations were obtained for the identical stocks included in the Dow, Jones averages, for approximately half the number of years in each interval.³ Not only

2. A few minor alterations were found necessary.

3. The necessary data were obtained from various issues of the *Financial Review* and the annual summaries included in the *Commercial and Financial Chronicle*.

were the years spread out over the entire interval, but the months, of which two were taken in each year, were made to vary so as to avoid bias as far as possible. An average monthly range based upon actual high and low quotations was thus computed for each period. The data obtained in this way were then compared with the exactly corresponding figures derived from a study of the statistics of high and low closing prices for the specific months and years in question. The resulting numerical relationship was transmitted to the final results previously obtained from a study of the Dow, Jones figures for each of the above periods. For example, if the range of the sample was found to be half again as large as the spread of the corresponding months using high and low closing prices for the years 1897-1914, the average monthly range based upon the same quotations previously calculated for this

TABLE 3
PRICE RANGES (CORRECTED)^a
(Unit: \$1)

Period	Average Monthly Range	Level of Prices	Average Monthly Range Expressed as Percentage of Price Level	Average Annual Range	Average Annual Range Expressed as Percentage of Price Level
1872-1896	4.68	52.70	8.88	15.07	28.60
1897-1914 ^b	6.86	72.72	9.43	23.94	32.92
1915-1927 ^c	11.17	104.04	10.74	39.00	37.49

a. Corrected by a process of sampling. The results are as if actual monthly high and low quotations were used throughout.

b. The mean monthly range for this period obtained by employing a sample of actual high and low prices was found to be 1.51 times greater than the spread derived from the use of high and low closing prices for the identical months in each year.

The mean annual range for the sample similarly obtained was 1.23 times greater; and the sample price level was 1.005 times greater.

c. The corresponding figures showing the excess of the sample over the uncorrected results for this period are 1.63, 1.20, and 1.001, respectively.

period was multiplied by one hundred fifty per cent. The same process was applied to the annual spreads. In this way, the Dow, Jones figures were made to conform to the actual high and low quotations of the New York Federal Reserve Bank. The adjusted data are shown in Table 3.

The most cursory inspection of the tables is sufficient to show that, so far as these tests are concerned at least, the fluctuations of stock prices were greater in the period 1897-1914 than in the earlier years, and greater in 1915-1927 than in either of the other two intervals of time. Moreover, the tests confirm each other. Not only are the monthly and annual spreads greater, indicating that prices fluctuated over a wider range with the passage of time, but also the average variation of the indexes from month to month shows an appreciable increase in each successive period.

It will be noted that no account is taken of the possible influence of secular trend upon these results. Indeed it was not considered necessary in dealing with ranges to compensate for the long time movement, because there are no grounds for believing that the trend factor should influence the high quotations any more or less than the lows. With regard to the movement of the indexes, the percentage deviations of the actual data from secular trend had, fortunately, already been calculated elsewhere⁴ and trial computations could therefore be made with relative ease. Using these statistics for the periods 1872-1896 and 1897-1914, no significant change was detected in the final results previously obtained. Accordingly, it was decided to forego the labor involved in the trend analysis of the last interval and to rest the case upon the unadjusted figures. This is the more justifiable because additional confirmation of the results obtained by the use of our tests is available in a study of Messrs. Owens and Hardy.⁵ Working along different lines, with the identical indexes of industrial stock prices employed here, these authors calculated the deviations of security prices from fitted lines of trend for the periods 1872-1897 and 1898-1922. Their findings are given on page 366.

One further step was taken in the present inquiry. It bears on the testimony (previously mentioned) that the closing of the Exchange would cause the disappearance of all semblance

4. See the Review of Economic Statistics for April, 1919, p. 169, and October, 1920, p. 194.

5. Interest Rates and Stock Speculation, p. 191.

	1872-1897	1898-1922
Average deviation (plus or minus) from trend . .	6.087	10.988
Standard deviation	7.507	13.758
Average (arithmetic mean) percentage deviation from trend	11.314	12.529
Standard deviation of percentage deviations . . .	14.304	15.516

of an orderly open market, and would be accompanied by security price fluctuations of considerably greater violence than is experienced while the Exchange continues to function. For this purpose an analysis of stock prices was undertaken for the short interval in 1914 when the New York Stock Exchange was forced to suspend operations because of the outbreak of the European War. It is true that the statistics available for this period are again not wholly satisfactory. But rather authentic, tho unofficial, quotations of bid and asked prices for a long list of securities for part of October, the whole of November, and about half of December, 1914, can be had.⁶ These data for the stocks included in the Dow, Jones computations of July 30, 1914, form the basis of this particular aspect of the investigation. By splitting the month of November approximately in two and combining the remaining figures, quotations for two "months" of practically equal length were obtained.⁷ Upon analysis it appeared that prices fluctuated less on the average than in the three periods when all the facilities of the highly organized New York Stock Exchange were open to traders.

The average monthly spread so obtained, admittedly imperfect, was found to be \$5.12, which when divided by the price level of this period gave a variation of 7.32 per cent. But apparently prices moved through a wider range in the month of November than in either October or December, for both of which intervals, it must be remembered, full data are not to be had. Using November as an illustration of a complete self-contained month the spread is computed to be \$6.77 or 9.69 per cent of the level of prices. Even these figures repre-

6. These are reproduced in *The Financial Review* for 1915, pp. 158-161.

7. The resulting October-November interval comprised 23 days; that of November-December, 24 days.

sent a materially smaller variation than the average monthly range figures for the period 1915-1927; and no considerable departure from those of 1897-1914. Moreover, it is well to bear in mind that these are bid and asked quotations, which may and probably do diverge from each other more than is apt to be the case with the high and low prices of securities actually bought and sold. Very likely, no great significance can be attached to the results obtained for this short interval. But it is obvious that the findings as a whole are in conflict with the usual statements.

It is possible that the results of this inquiry can be reconciled with the implications of Mr. Whitney's various statements. It may be that the growing instability of stock prices during the period investigated was due to the operation of forces powerful enough to more than offset the effects of short selling and other market developments tending, under certain conditions, to have a stabilizing influence. Consideration of these factors, however, lies outside the scope of the present note.

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LIFE TABLES FOR AUTOMOBILES¹

The automobile industry has become one of the largest industries in the United States. The wide distribution of ownership and rapid depreciation are two of the outstanding features of this form of property. Depreciation and obsolescence are two wasting processes that give an automobile a surprisingly short life. Notwithstanding this important characteristic of the automobile, until very recently, there has been no reliable data of an actuarial nature and little reliable data of any kind pertaining to the depreciation of this form of property.

One of the most important economic problems is that of depreciation. "It can be treated effectively only when approached on an actuarial basis with full understanding of the frequency curves which governs the displacement, year by year, of the physical units involved."

The use of life tables in calculating depreciation seems so natural as to be almost inevitable. The automobile industry has need of life tables for the same reason that insurance companies have need of such tables. And it may easily be possible that such tables can be constructed with precision quite as high as those now in use for humans.

Life characteristics are strikingly similar in both cases. In each case there is destruction by chance without predisposition to death. In each case as age increases there is an increased inability to withstand destruction.

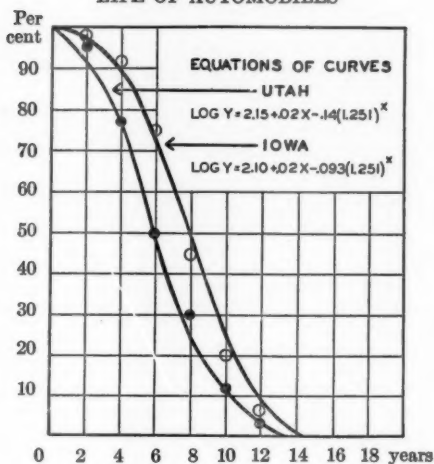
The author has found a good fit for the curve of the following data by a more or less empirical method of curve-fitting, though he has been influenced to a considerable extent by the work of E. B. Kurtz. The equations for the two curves are:

$$\text{For Utah,} \quad \text{Log. } y = 2.15 + .02x - .14 \times (1.251)^x$$

$$\text{and for Iowa,} \quad \text{Log. } y = 2.100 + .02x - .093 \times (1.251)^x$$

1. Revision of a paper delivered at the Twenty-Fifth Annual Meeting of the Utah Academy of Sciences at Salt Lake City, Utah, May 13, 1932.

LIFE OF AUTOMOBILES



LIFE TABLES FOR AUTOMOBILES

Age	State of Utah* Number Alive at Beginning of Age Interval	Number Dying at Age Interval	State of Iowa† Number Alive at Beginning of Age Interval	Number Dying at Age Interval
0- 1	13,500	170	60,000	400
1- 2	13,330	340	59,000	1,000
2- 3	12,990	910	58,000	1,000
3- 4	12,080	1,550	57,000	1,900
4- 5	10,530	2,300	55,000	3,900
5- 6	8,230	1,480	51,000	6,700
6- 7	6,750	1,350	45,000	10,400
7- 8	5,400	1,350	34,000	7,700
8- 9	4,050	1,350	27,100	7,600
9-10	2,700	1,080	19,500	7,500
10-11	1,620	540	12,000	5,000
11-12	1,080	540	7,000	3,800
12-13	540		3,200	2,200
13-14			1,000	1,000

* The data for the Utah table was taken from the automobile registration records for the State of Utah.

† The data for the Iowa table was taken from Automobile Operation Costs and Mileage Studies, page 35, by Robley Winfrey.

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